THE

AMERICAN NATURALIST

VOL. XXIV. AUGUST, 1890. 284.

THE EXTINCT SIRENIA.

BY E. D. COPE.

THE Sirenia occupy an especial place in the mammalian economy, which is only shared by the seals. They are denizens of the coasts of the sea and its branches, and of the larger rivers. Their present distribution differs from that of the seals in that it especially includes the tropics, where seals are rare; and excludes the polar regions, where seals abound. Extinct forms occur, however, in all the northern temperate regions that have been explored, and there is no reason to doubt that the order was of world-wide distribution during the early and middle parts of Cænozoic time.

The derivation of the Sirenia is shrouded in mystery. They have evidently diverged from land mammals of primitive placental type, and have become specialized in accordance with their peculiar modes of life, and have in many respects degenerated. Rudiments of pelvis and posterior limbs are present in most of them, and they are especially large in some species of the extinct genus Halitherium. Part of such a pelvis from South Carolina is represented in Plate XXV, Fig. 6. The dentition has become more and more reduced, till the enamel layer is lost in Halicore, and the teeth have all disappeared in Rhytina. The least generalized form is Prorastomus Owen, of which remains of a single species (*P. sirenoides*) have been found in the late Cænozoic beds of certain islands of the West Indies. Here the dentition is stated by Lydekker to be: I. $\frac{3}{3}$; C. $\frac{1}{1}$; M. $\frac{8}{8}$?.

LIBRARY

The families of this order are the following:

Incisors present in normal number; canines present; molars numerous, rooted, and enamel-covered; *Prorastomidæ.*

Incisors, in less than normal number; no canines; molars in normal number, rooted, and enamel-covered; *Halitheriidæ.*

No incisors; molars present, covered with enamel, and in increased number; *Manatidæ.*

Incisors present; molars prismatic, without enamel, and in reduced number; *Halicoridæ.*

Teeth none; *Rhytinidæ.*

The PRORASTOMIDÆ includes but the one genus, Prorastomus Owen, and this the single species *P. sirenoides* Owen. This is a highly interesting form, having a dentition intermediate between that characteristic of other members of the order and the typical mammalian formula. This is especially true in the normally constituted incisor and canine teeth. The molars are, like those of the manatees, cross-crested grinders, and in larger number than that normal to mammalia generally. The single species has been found in beds of uncertain but probably Eocene age in the West Indian Island of Jamaica.

The greater number of extinct Sirenia belong to the HALITHERIIDÆ, and they occur alike in the old world and in the new. The genera are as follows:

Incisors $\frac{2}{?}$; molars?; *Dioplotherium* Cope.

Incisors $\frac{1}{1}$; molars 6 or 7, the last superior the most complex; symphysis decurved, compressed; *Halitherium* Kaup.

Incisors $\frac{1}{1}$; premolars, 3; molars, 4, the last superior reduced, simple; *Miosiren* Dollo.

Incisors $\frac{?}{1}$; molars?; symphysis long, not decurved, cylindric; *Anoplonassa* Cope.

The incisors in the first three genera are tusk-like; in the last they are in the lower jaw, with short root, and are easily shed. Six or seven species of Halitherium are known from the Miocene and Pliocene beds of Western and Southern Europe. The

H. schinzii Kaup from the lower Miocene of Germany (Fig. 1*a*) is about as large as the manatee, while the *H. forrestii* Capellini is much larger, and is from the lower Pliocene of Italy. The *Miosiren kockii* Dollo is known from a skeleton from the Miocene of Belgium. It was rather larger than the manatee, and was nearest to the Halitheria. The principal difference is seen in

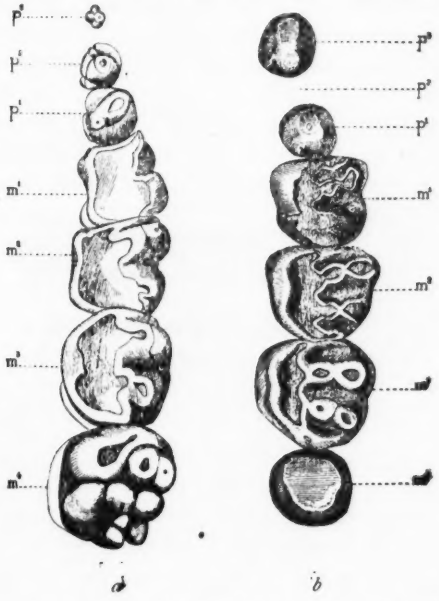


FIG. 1.—Dentition of Halitheriidæ, two-thirds natural size, from Dollo. Fig. *a* *Halitherium schinzii*; *b*, *Miosiren kockii*.

the reduced last superior molar tooth, which shows indications of the reduction in number which took place in the dugong (Fig. 1*b*). The largest species supposed to belong to the family is the *Hemicaulodon effodens* Cope, from New Jersey, which is known from a large superior tooth only. The dentine of this tooth has regular transverse ridges, which are also traceable in a Halitherium (*H. capgrandi* Lart.), and it is covered by a layer of cementum. As the molar teeth are unknown, the reference of this animal to this family remains uncertain. The most primi-

tive form of the Halitheriidæ known is the genus Dioplotherium Cope, with two superior incisors. *D. manigaultii* is a large species which was found near Charleston, S. Carolina, by Dr. G. Manigault of that place (Plate XXV). The first incisor lacks the distal expansion of that of Halitherium. The molars are unknown.

Another and still more remarkable form has been discovered in the phosphatic deposits of South Carolina. This is the genus Anoplonassa Cope, in which the symphysis of one of the jaws is much elongated, is semi-cylindrical, and is not decurved as in the other members of the family. The premolar and molar teeth are shed at maturity, leaving indistinct traces, except, perhaps, the anterior incisor, which is represented by a large, shallow alveolus, and is perhaps not shed (Fig. 2). The muzzle is adapted to

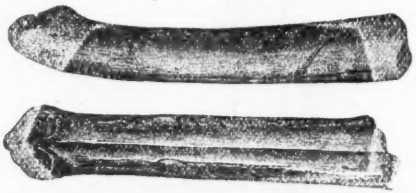
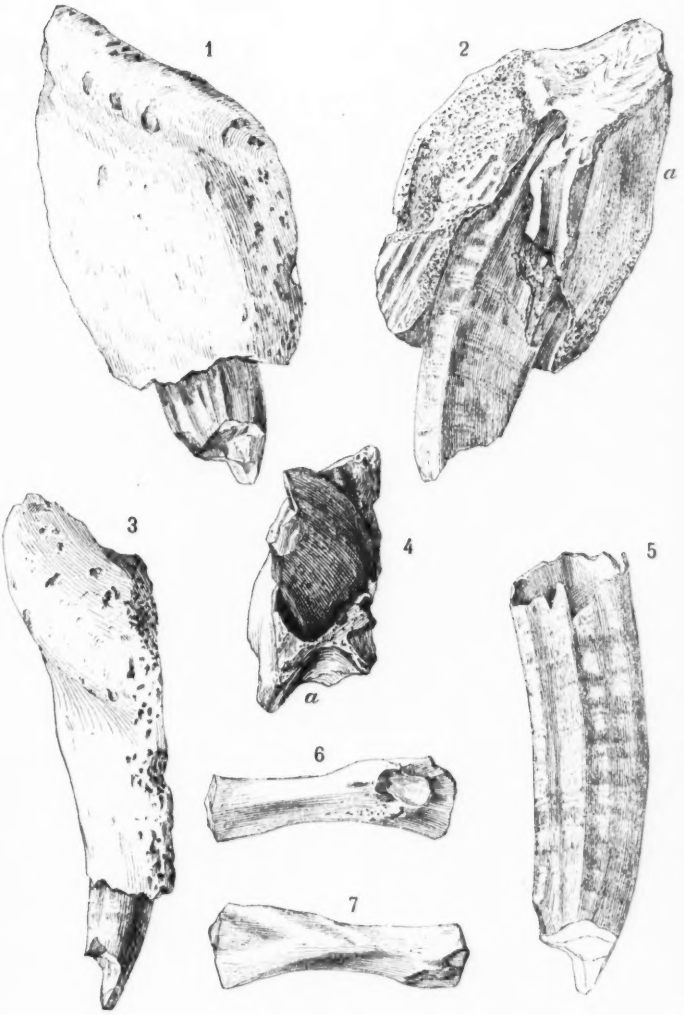


FIG. 2.—*Anoplonassa forcipata* Cope; one-fourth natural size. Original; from South Carolina.

being inserted deep into mud in order to draw thence mollusca or other kinds of food. But one species is known, the *Anoplonassa forcipata* Cope. It is by no means certain that it belongs here, and it may be a Cetacean.

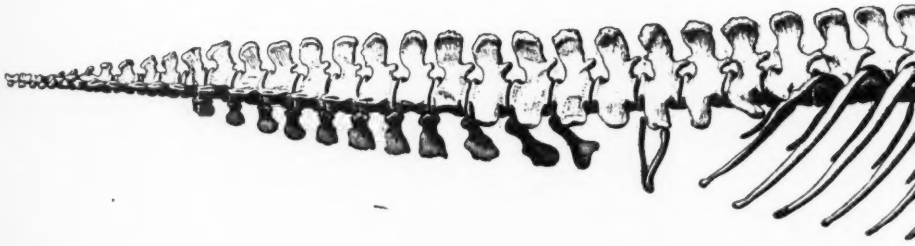
The MANATIDÆ are remarkable for the number of their molars. In the genus Manatus there are eight in the permanent dentition, and a ninth anterior tooth, which is early shed. These molars are all alike, and with two transverse crests in the upper jaw and three in the lower. There is a minute incisor in the upper jaw, which is shed early. Besides the three living species of Manatus but few extinct species are known. Teeth resembling those of the Floridan species have been found in the Charleston deposits, and have been named by Leidy *M. fossilis*. A form from the Eocene of Egypt has been named by Owen *Eotherium egyptiacum*. Filhol does not distinguish the molars from those of Manatus as to their structure, but their number is unknown.

PLATE XXV.



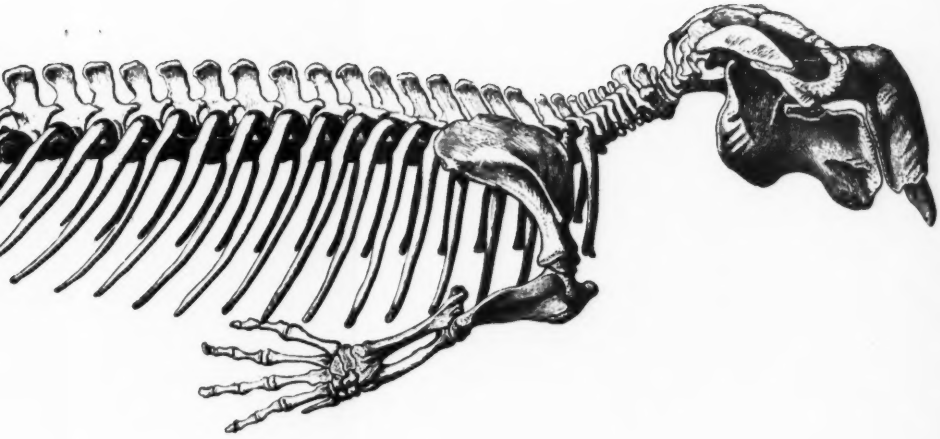
Dioplotherium manigaultii Cope.

PLATE X



Halicore dugong

LATE XXVI.



icore dugong Cuv.

Fossil HALICORIDÆ are unknown, except some bones of very

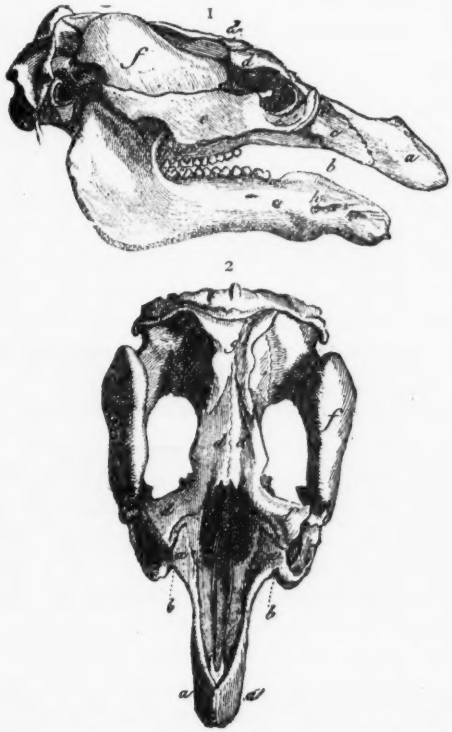
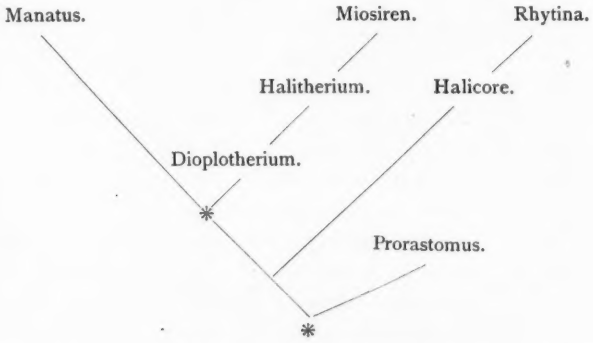


FIG. 3.—*Manatus americanus* Cuv.; skull one-twelfth natural size; from Cuvier. 1, ight side; 2, from above. *a*, Premaxillary bone; *b*, foramen infrantitole; *c*, maxillary; *d*, frontal; *e*, molar; *f*, zygomatic process of temporal; *g*, parietal.

late Tertiary age found in Australia. In the existing genus the dental formula is I. $\frac{1}{0}$; C. $\frac{0}{0}$; M. $\frac{2}{2}$, and the molars are prismatic and of cylindric or oval section, as in some Edentata. (Plate XXVI.) The RHYTINIDÆ are represented thus far by the typical genus and species only, the *R. gigas* Zimm., which dwelt on the coasts of Behring Sea up to a late period of human history. It is one of the large species of mammalia exterminated by man, and its bones are found in considerable abundance on Behring's Island, Commander's Island, etc. Nearly complete skeletons are

preserved in the Museums of St. Petersburg, London, and Washington.

The lines of descent of the Sirenia may be expressed as follows:



EXPLANATION OF PLATES.

PLATE XXV.—*Dioplotherium manigaultii* Cope. Three-eighths natural size. Figs. 1–4, part of premaxillary bone with incisor alveoli, and I. 1 in place; 1 outside; 2 inside; 3 front; 4 from below; *a* alveolus of external incisor. Original; from type in Museum of Charleston, S. C. Figs. 6–7, os innominatum of unknown Sirenian, from Charleston. Reduced.

PLATE XXVI.—*Halicore dugong* Cuv. Skeleton, from Cuvier.

THE CONCRESCENCE THEORY OF THE VERTEBRATE EMBRYO.

BY CHARLES-SEDGWICK MINOT.

(Continued from page 629.)

Blastodermic Vesicle with Two Layers.—Of this stage we have several descriptions; for the rabbit by Kölliker (Grundriss, p. 89), Hensen, *24*, C. Rabl, *44*, 141, as well as the older accounts by Bischoff, *6*, and Coste, *14*, and the brief mention by Heape in Foster and Balfour's Embryology, 2d edition, 316–320; for the mole by Heape, *23;* for the dog by Bischoff, *7;* for the cat by Schäfer, *52;* for the sheep by Bonnet, *10;* and for several rodents as indicated in the section on inversion of the germ layers, p. 711.

The two-layered stage is found in the rabbit about seven, in the sheep about thirteen days after coitus. The dimensions for the sheep are about 4 mm. for the greatest diameter and 2–3 mm. for the lesser diameter.

The two layers form each a closed sack; the embryonic shield is well marked as a round spot less translucent than the walls elsewhere. The outer layer has everywhere a distinctly epithelial character; in the region of the shield its cells are columnar with spherical nuclei; in the rabbit the cells are low, and the nuclei lie nearly at one level (for a good figure see Heape, *23*, Pl. XXI, Fig. 49); in the sheep the cells are taller, and the nuclei are at various levels; in the mole and in various rodents there are several layers apparently, but perhaps in them also the epithelium is columnar, as it certainly is later; at the edge of the shield there is an abrupt change to a very thin layer, with widely expanded cells; consequently in the region of the shield the nuclei are close set, while outside the shield they are wider apart. The change at the edge of the shield is at first less abrupt, but at the present stage is very marked. A similar difference exists in the inner layer: although its cells are very much thinned out everywhere, yet the layer is slightly thicker in the region of the shield; the nuclei of the inner layer are everywhere somewhat flattened, and they are larger and farther apart than the nuclei of the outer layer, a difference which is very obvious in surface views, both during this and the next following stages. The inner layer has an epithelial character in the region of the shield, but further away the cells move apart, and being connected by processes resemble embryonic connective tissue (Bonnet, *10*, 192; Hensen, *24*, Figs. 15 and 11B on Taf. VII; E. Van Beneden, *2*). The relations are illustrated by the accompanying Fig. 17, representing the shield in the sheep at thirteen days, and of a vesicle measuring 4 mm. by 2 mm.; at the left of the figure the layers are folded back over the shield.

The next changes which occur are principally those of growth, both of the vesicle as a whole and of the embryonic shield, which also begins to arch up; the vesicle and shield both become oval; usually the oval shield lies lengthwise, but in the deer, as

shown by Bischoff, it lies transversely of the vesicle. The size of the shield is quite nearly uniform among the placented mammals in which it has been studied, but the size of the vesicle varies extremely; especially noteworthy is the excessively rapid elonga-

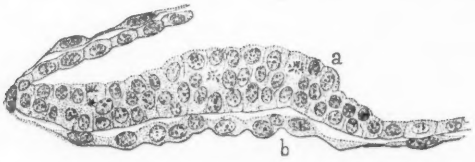


FIG. 17.—Transverse section of the embryonic shield of the blastodermic vesicle of a sheep, thirteen days pregnant, after Bonnet. *a*, outer layer of shield; *b*, inner layer of shield.

tion in ungulates (pig, sheep, goat, and deer); in the sheep, for example, it trebles or sextuples its length in less than a single day after the shield appears. The next step is the appearance of a middle layer, at least in sheep (Bonnet, *10*, 192–196, *11*, 42), which shows in the fresh specimen as a slight turbidity of the vesicular walls just outside the edge of the shield, while in the region of the shield there is no middle layer whatever. Sections show that the new layer consists of loosely scattered cells connected by anastomosing processes. It is everywhere absolutely distinct from the outer layer, but merges at many points with the inner layer. From this connection Bonnet concludes that the middle layer is derived from the inner layer by what must be called a process of delamination. So far as known to me, nothing analogous to this middle layer has yet been observed other mammals. The next important step, again according to Bonnet, *10*, 195, is the appearance of Hensen's knot, which takes place while the peripheral middle layer is developing. The knot is at first a small thickening on the under side of the outer layer; it is situated on the middle line of the shield, a little nearer one end than the other. It is distinctly separated from the inner layer, but is connected with the cells of the middle layer, which have now developed themselves in the middle region of the shield also. Bonnet maintains that the knot gives off cells which contribute to the formation of the middle layer. The knot marks the front end of the future primitive streak.

The appearances in a sheep's ovum at this stage are illustrated by Fig. 18 of a vesicle of 12–13 days from a sheep; the vesicle measured 55 mm. in length by about 1.5 in breadth, but the length of the vesicle is extremely variable at this stage; the specimen had been stained to bring out the small close-set nuclei of the outer layer, and the larger, more widely-set nuclei of the inner layer. The upwards-arching embryonic shield, *Sh*, shows Hensen's knot, *kn*, and the beginning primitive streak, around the edge of the shield the middle layer makes an irregular shadow, *mes*.

A condition of the blastodermic vesicle similar to that described is figured by Coste for the rabbit, by Bischoff for the rabbit *6*, Taf. IX., Fig. 42, C,—for the dog, *7*, Taf. III., Fig. 28, B; and the gradual extension of the second layer is recorded for the mole by Heape, *23*. Since it is known to occur in rodents, carnivora, and insectivora, it is probably true of all placental mammals that the one-layered vesicle becomes two-layered by the outgrowth of cells for the "inner mass" found at the close of segmentation; this is the first step of development after segmentation.

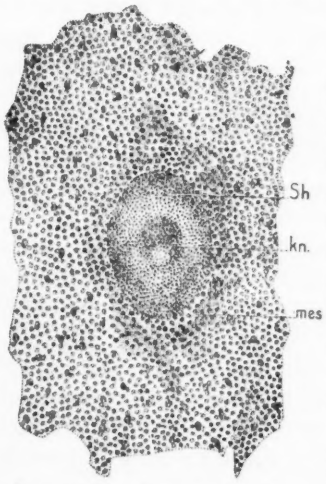


FIG. 18.—Central portion of a sheep's blastodermic vesicle of 12-13 days. *Sh*, shield; *kn*, Hensen's knot; *mes*, "Mesoblasthof"; after Bonnet, 34 diams.

Rauber's Deckschicht has evidently great importance. It was first described by him in the rabbit, *45*; and was also discovered by E. Van Beneden, *1*, who, however, made the blunder of considering it as the permanent ectoderm, and the true ectoderm below it as the mesoderm; this error has been amply corrected by Kölliker, and is now admitted by Van Beneden (see Van Beneden and Julin, *4*). Its disappearance in the rabbit has also been studied by Lieberkühn, *41*. Balfour (Comp. Embryol, II., 219), from investigations on the rabbit by himself and Heape, concluded that the cells of the deck-

schicht disappear by being incorporated in the true ectodermal layer, becoming at the same time columnar; this view is verified by Lieberkühn, *42*, 400–401. As already stated, the rodent modification of the deckschicht is discussed below, page 711. In the rabbit the deckschicht disappears before the second layer of cells grows completely round the vesicle.

Blastodermic Vesicles with Primitive Streak.—The knot of Hensen becomes the front end of the primitive streak, which lengthens backward; during the same period the vesicle as a whole enlarges; in ruminants the enlargement is enormous and very rapid.[1]

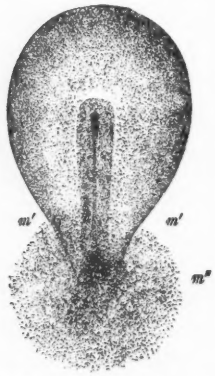


FIG. 19.—Embryonic shield of a rabbit's ovum of five days, to show the primitive streak and the distribution of middle layer, *m'*, *m''*; after Kölliker. 28 diams.

The primitive streak always lies in the long axis of the shield. The formation of the primitive streak begins with the union of Hensen's knot with the inner layer, so that at the knot all three layers are actually united,—the condition originally discovered by Hensen, *24*, 268. The union of the knot with the inner layer spreads backward along the line which is to become the primitive streak; soon the axial growth reaches the edge of the shield, and the streak and shield elongate together, the latter becoming pointed at its hinder end. We thus have a pear-shaped shield, with the primitive streak running forward from its pointed end; the anterior end of the primitive streak is somewhat enlarged, and the posterior end is considerably thickened; the three layers are united along the primitive streak. Figure 19 represents the embryonic shield of a rabbit embryo; the shield measured 1.34 mm. in length, and 0.85 mm. in width; the primitive streak is a broad band, corresponding to the axial thickening, and extends about two-thirds of the length of the shield; the middle layer, *m'*, *m''*, occupies a circular area around the hind end of the streak;

[1] Bonnet states that in the sheep the blastodermic vesicles must elongate during this period at the rate of one centimetre an hour.

for a similar stage in the opossum see Selenka, *57*, Taf. XVIII., Fig. 6; in the mole, Heape, *23*, Pl. XXVIII., Fig. 12; in the sheep, Bonnet, *10*, Taf. X., Figs. 39, 40. Cross sections show: the concrescence of the three layers in the axis; the greater width of the streak in front (to this wide anterior end of the streak the term Hensen's knot continues to be applied); and show also the increasing thickness of the streak posteriorly. The primitive groove, which is a shallow depression of the outer layer, appears first over Hensen's knot, and thence extends gradually backward along the median line of the primitive streak. A transverse section through about the middle of the streak at this stage in the mole is represented in Fig. 20, and may be considered thoroughly typical.

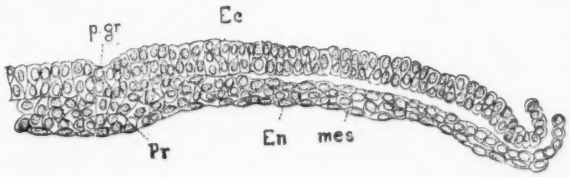


FIG. 20.—Section of the primitive streak of the mole; *prg.*, primitive groove; *Ec.*, ectoderm; *mes.*, mesoderm; *En.*, entoderm; *Pr.*, primitive streak; after Heape. (In sections nearer the hind end the groove *Pr.* does not appear; and the inner layer is distinct, though not separated axially from the middle layer.)

Blastodermic Vesicles with Primitive Streak and Head-Process.—In the stage we are now considering the axial thickening becomes sub-divided into two parts, an anterior known as the head-process, (Kopffortsatz), and the true primitive streak. The two are distinguished by the fact that the axial thickening in the region of the process is separated from the outer layer, but fused with the inner layer, while in the region of the streak it is united with the outer layer. At this stage we find further that, except at the anterior end, *i. e.*, in the region of Hensen's knot, the axial thickening of the streak is not connected with the inner layer. Hence cross sections may give us three different appearances, according to the level at which they are taken.

The head-process was first distinguished, so far as I am aware, by Kölliker, *32*, also (Entw. ges., 1879, p. 271). Lieberkühn, *42*,

first showed that in it appears a small longitudinal canal, the walls of which form the notochord. Heape, *23*, discovered that the hinder end of this canal opens exteriorly in the mole, and Bonnet, *10*, made the same observation on sheep. Strahl describes the "process" in the rabbit incidentally in his paper on cloaca, *63*; additional information is given by Bonnet, *11*, 65–75, concerning the sheep, and by C. Rabl, *44*, concerning the rabbit. Especially valuable is Fr. Carius' dissertation, *13*. In the guinea pig, according to Carius, after the formation of the primitive streak, the middle layer grows out in *all* directions, and lies free between the inner and outer layers. In front of the primitive streak the outgrowth takes place in three divisions, one median, two lateral. The median outgrowth is the head-process, and it becomes later united with the inner layer, but at first lies entirely free (embryo of 13–14 days). The first indication of the formation of a canal is an alteration of form in the cells, which elongate in directions at right angles to the axis of the head-process, so that their oval nuclei are radially placed. The change begins posteriorly and progresses forward; while it is going on, the anterior extremity of the head-process fuses with the inner layer. The radial cells move apart, so that there arises a longitudinal canal; subsequently the canal loses its inferior wall, so that it becomes continuous as a cavity with the cavity of the vesicle formed by the inner layer. In the rabbit the head-process is always free at first, but very early unites with the inner layer, in which condition it was found by Carius, *13*, 18–19, at 7½ days.[2] In the rabbit Hensen's knot presents at this stage a small depression (the front end of the primitive groove), into which a small plug of tissue projects up from the underlying axial thickening (Carius, Fig. 7); Van Beneden homologizes this with the anus of Rusconi and its plug of yolk matter, but inasmuch as the rabbit and bats are the only mammals known to have such a plug, and as the anus of Rusconi is necessarily at the hind end of the primitive streak, Van Bene-

[2] C. Rabl, *44*, 143–145, states expressly that in the rabbit the axial thickening is not connected with the inner layer, either under the head-process or under the primitive streak. He differs from other investigators in this so much that I think his preparations were probably defective; indeed his own figures suggest at once that the inner layer has been artificially separated from the overlying ones.

den's homology seems to me utterly baseless. The relations of the head-process in the sheep are very much as in the rabbit, Bonnet, *11*, 65–67; the cells of the middle layer are at first free as they grow forward to form the process, but subsequently are found united with the inner layer.

The head-process (cf. Lieberkühn, *43*) probably always grows, as is certainly the case in the guinea pig, at its hinder end and at the expense of the primitive streak; it is, I think, in this manner that the often-noticed shortening and final disappearance of the streak is effected. The back growth of the process establishes the necessary condition for the growth of the notochord at its hind end.

Homologies of the Mammalian Blastocyst.—There is at present no satisfactory and generally accepted interpretation of the parts of the mammalian blastocyst as compared with the corresponding stages of other vertebrates. The principal difficulties are two, namely: 1, the development of the two-layered stage; 2, the identification of archenteric cavity.

1. The two-layered stage is said to develop by an *inner* layer growing out in all directions from the inner mass of cells left at the close of segmentation. Now we must look on this statement with great suspicion, because in *all* other vertebrates it is the ectoderm which grows over the ovum; it is therefore improbable that in mammals it is the entoderm; and, in fact, I cannot find anywhere any definite observations to show that it is the inner layer the spreading of which renders the blastodermic vesicle two-layered. If the current statement proves erroneous, then we shall gain much towards a direct comparison of mammalian development with that of other vertebrates.

2. The permanent archenteric cavity arises from two sources, namely: the large space of the vesicle enclosed by the inner layer, and secondly, the so-called chorda-canal of the Kopffortsatz. Concerning the homologies of the latter, three views have been advanced: 1, it is the homologue of the tubular notochord; 2, it is the trué archenteric cavity (E. Van Beneden, *3*); 3, it is the blastoporic canal (Minot, 1887, Buck's Reference Handb., VI., p. 247). The third view is the one which I adopt.

Against the first view it is to be urged that the tubular stage of the notochord does not appear actually, but is assumed for lower vertebrates, because the chorda appears in them as a *groove* and as afterwards separated off, and although it is then a solid rod of cells it has been considered to represent an epithelial tube; moreover, this stage occurs after the notochord is permanently separated from the entoderm, and finally the whole of the rod of cells (or walls of the chordal tube) participates in the formation of the notochord. The mammalian "chorda-canal" is a true tube, which the notochord is not; it fuses with the entoderm, and the true notochord is separated off subsequently, only the dorsal part of its walls produces notochordal cells. These characteristics are, on the other hand, precisely those which belong to that hinder portion of the archenteron which we call in other vertebrates the blastoporic canal; this canal produces the notochordal cells from its dorsal wall; it passes through a mass of cells, and lies in Sauropsida (the vertebrates nearest the mammals) above the archenteric cavity proper. Against the second view—E. Van Beneden's—that the "chorda-canal" is the archenteron, it is to be remarked that the archenteron is bounded above by entodermal cells and below by the entodermal yolk, and the representative of the yolk is not to be found in the lower wall of the "chorda-canal." Hence it seems to me clear that Minot's view is the only defensible one, for the chorda-canal agrees in its essential features with the blastoporic canal of vertebrates, and only with that canal.

If this homology is correct then the canal must lead into the archenteron; hence the large space within the inner layer must be homologous with the archenteron, because the chorda-canal opens into it. This leaves us still entirely in the dark as to how the development of the mammalian entodermal canal is to be homologized with its development in other vertebrates.

According to the view I have advocated, the blastoporic canal of mammals is peculiar in persisting for a long time as a separate canal above the archenteron, and then losing its lower wall along a considerable stretch at once; in other vertebrates it loses in front as fast as it grows behind, so that it is always short.

As regards the homologies of the layers, I consider that the outer layer of the vesicle is ectoderm, and the thickening which constitutes the embryonic shield corresponds to the ectodermal thickening of the embryonic area in Sauropsida; the inner layer and the lining of the "chorda-canal" (blastoporic) is the entoderm; the remaining tissue of the primitive streak and head-process, together with the middle layer, constitute the mesoderm. In order not to prejudge the question, the names of the germ-layers have not been used in the preceding description of the blastodermic vesicle.

Inversion of the Germ-Layers in Rodents.—In many but not all rodents the outer layer, Rauber's Deckschicht, of the embryonic shield undergoes a remarkable hypertrophy immediately after the close of segmentation proper; the deckschicht, together with the ectoderm underlying it, becomes a plug which pushes in the other layers, thereby profoundly altering the topography of the ovum. In the mole, Heape, *23*, the hypertrophy is not very great, and the plug disappears soon, so that there is no great change; in guinea pigs, mice, and Arvicola the plug becomes very large, and remains for a long time. The plug is very long, and the ovum elongates with it, changing into an almost cylindrical vesicle (Selenka's *Keimcylinder*). The plug becomes hollow, and the cells corresponding to the deckschicht become separated from those which are to form the ectoderm of the embryo. Three modifications of the hollowing out of the plug and of the separation of its two parts are known. The changes referred to are very clearly illustrated by Selenka, *56*, Taf. XVI., in a series of comparative diagrammatic figures. In the simplest case, Fig. 21, the plug acquires a single cavity, *a*; the cells around the upper end, *D*, correspond to the deckschicht, and serve partly to attach the ovum to the uterine walls; the cells, *Ec*, around the lower end of the cavity become the embryonic ectoderm; all the cells around the cavity, *a*, are homologous with the outer layer of the embryonic shield of other mammals. The cavity, *c*, of the vesicle is very much reduced; the inner side of the shield, *i. e.*, of the plug, is lined by an inner layer, *en*, which gives rise to the entoderm. The outer layer of the vesicle is very thin, and is found to unite very closely

with the walls of the uterus. Hence, when the uterus is opened only the hollow plug and its covering of entoderm can be removed; as it makes a two-walled vesicle, it was considered to represent by itself the two-layered stage of the blastodermic vesicle. Thus it came that Bischoff believed that in various rodents the ectoderm lies inside, the entoderm outside. Bischoff's observations, *8*, *9*, which have been confirmed by Reichert, *47*, are correct, but the inversion of the layers is apparent, not real. The actual homologies were not discovered until the improvements in microscopic technique enabled Selenka, *55*, *56*, and Kupffer, *38*, to make sections of uteri with ova in situ, and in their sections to find the true outer layer. Their observations removed at once the apparent anomaly in the position of the germ-layers. Their results have been in the main confirmed by Fraser, *20*, and extended to another species by Biehringer, *5*.

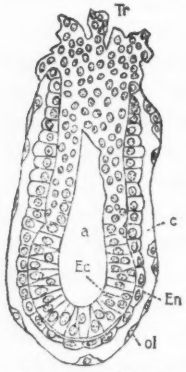


FIG. 21. — Blastodermic vesicle of *Mus sylvaticus*, after Selenka. *a*, cavity of träger; *Ec.*, ectoderm; *c*, cavity of blastodermic vesicle; *En.*, entoderm, *ol.*, outer layer.

In *Mus decumanus* the ectodermal cells early become a separate spherical mass, thus dividing the plug into two parts; a cavity appears in each part; these two cavities soon become confluent, and the inner layer of cells having meanwhile developed, the relations become essentially identical with those in *Mus sylvaticus*, Fig. 21. In *Mus musculus* the development is similar, but there is the additional peculiarity that the deckschicht is regularly invaginated at first, so as to form a small pit, into which living tissue grows. In Arvicola this invagination is more marked and lasts longer, but in both cases it is early obliterated.

Arvicola represents the second modification mentioned above; it has not only the invagination to distinguish it, but also the very early formation of the cavity of the plug as a fissure between the deckschicht and the true ectoderm cells.

The guinea pig offers the third modification, and is characterized by the early complete separation of the plug into its two parts;

the deckschicht remains at one end of the ovum and forms the träger; it acquires an independent cavity of its own; the ectodermal portion of the plug forms a solid spherical mass, which is transported to the opposite pole of the ovum; it subsequently becomes hollowed out, presenting a space, which, as the later development shows, is the amniotic cavity. The inner layer passes from the edge of the träger around the sphere of ectoderm; if the two parts of the plug were connected the relations of the inner layer would be the same as in *Mus sylvaticus*, Fig. 21.

The subsequent development of the rodents with inverted layers is modified in various secondary features, which it will be unnecessary for us to study. In all typical respects the embryonic development agrees with that of other mammals, even as to details.

Blastopore.—The blastopore is the small opening which is situated at the end of the primitive streak, and leads into the archenteric cavity; the portion of the archenteron, which is next the blastopore, is a narrow passage through the thick mass of cells which make the posterior part of the primitive streak; this passage is called the blastopore canal; from its dorsal wall the cells arise which form the notochord.

While concrescence is going on the blastopore changes its position, being always at the end of the archenteron; after concrescence is completed the archenteron expands so as to extend below the primitive streak, behind the blastopore; hence the blastoporic canal appears as shown in Fig. 22, like a separate tube; it must not, however, be forgotten that it is part of the archenteron.

The blastoporic canal remains open in marsipobranchs, ganoids, amphibians, and selachians, and is well known. It is also found in all the amniota, but the recognition of its occurrence in this group was long hindered by the fact that it does not exist at first as a canal. The blastopore is the opening of a tube through the primitive streak; now if the cavity of this tube is obliterated by its walls growing together, then the primitive streak would become a solid mass of cells; this is the condition we actually find in the amniota, Fig. 22 A; since the posterior part of the primitive streak is morphologically the thick walls of the blastopore, the homologies are not altered by the temporary ob-

literation of the canal, which moreover appears as such in later stages. Its development has been especially studied in reptiles

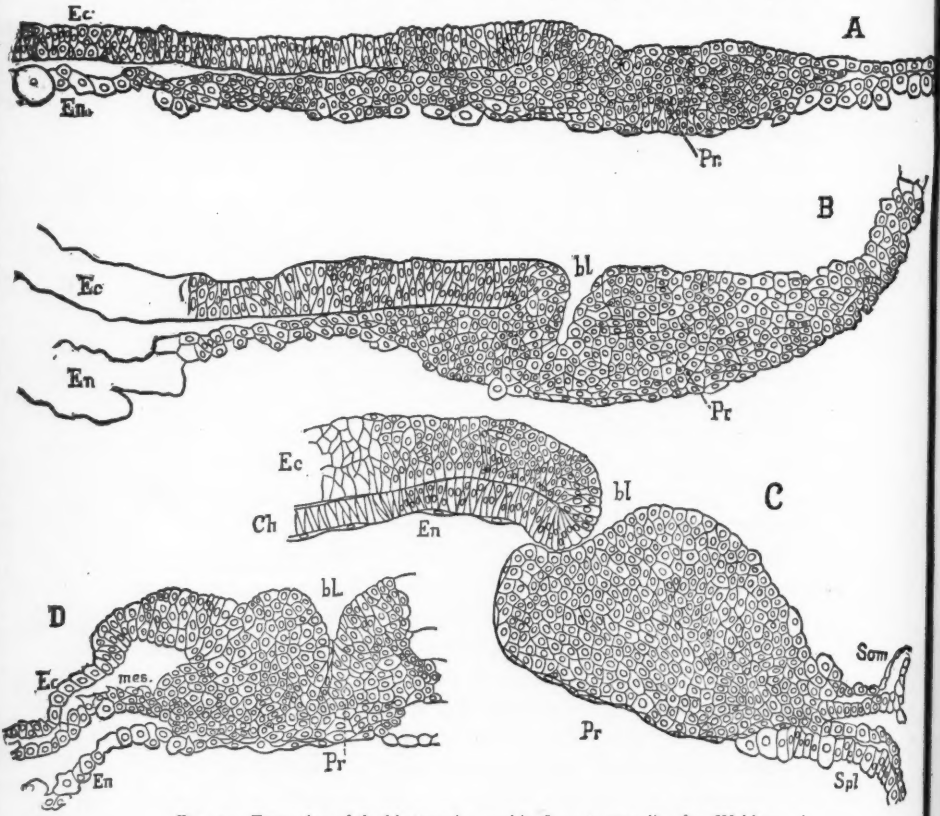


FIG. 22.—Formation of the blastoporic canal in *Lacerta muralis*, after Weldon. A, B, C, longitudinal sections of three successive stages of the blastoderm, which in each case has been removed from the yolk; the space under the entoderm, *En.*, is the archenteric cavity. D, tranverse section of the posterior part of the blastopore, a little younger than C. *Ec.*, ectoderm; *En.*, entoderm, *Pr.*, primitive streak; *bl.*, blastopore; *Ch*, notochord; *mes.*, mesoderm. Fig. B, *bl.* This pit soon becomes a complete perforation.

by Weldon, *66*, Kupffer, *37*, *39*, H. Strahl, *58*, *59*, *60*, *61*, *62*, Hofmann, in Braun Thierrich, pp. 1892-1897, and others; it begins as a pit upon the external surface.

Concrescence involves necessarily the gradual recession of the blastopore; in most vertebrates the blastoporic canal merges at its front end into the main archenteric cavity, but in mammals, if the homologies I have drawn above be correct, the canal persists for a considerable period as the "chorda-canal" of German writers.

The blastopore is not homologous with the gastrula mouth, but is merely a small portion thereof; in front of it the gastrula mouth is closed by concrescence; while concrescence is going on there will be a part of the gastrula mouth open behind the blastopore; when concrescence is completed the blastopore is at the end of the elongated gastrula mouth, the lips of which are united throughout the remainder of their length. The blastopore is not a fixed point, being merely the opening of the closed archenteron, and as by concrescence the archenteron is elongated, in precisely the same measure the blastopore travels backward.

AUTHORITIES CITED.

1. BENEDEN, ED. VAN. La maturation de l'oeuf, la fécondation et les premières phases du développement embryonnaire des mammifères d'après des recherches faites chez le Lapin. *Journ. Zool.*, V., 10–56, 1876.

2. ——. Recherches sur l' embryologie des mammifères. La formation des feuillets chez le Lapin. Arch Biol., I., 136–224. Pls. IV.–VI., 1880.

3. ——. Untersuchungen über die Blätterbildung den Chordakanal und die Gastrulation bei den Säugetieren. Anat. Anz., III., 709–714, 1888.

4. BENEDEN, ED. JULIN, CHARLES. Recherches sur la formation des annexes foetales chez les mammifères (Lapin et Cheiroptèra). Arch. Biol., V., fasc. 3, pp. 369–434. Pls. XX.–XXIV., 1884.

5. BIEHRINGER, JOACHIM. Ueber die Umkehrung der Keimblätter bei der Scheermaus (*Arvicola amphibius* Desm,). Arch. Anat. Physiol. Anat. Abth., 279–286. Taf. XVII., 1888.

6. BISCHOFF, THEO. L. W. Entwickelungsgeschichte des Kanincheneies Braunschweig, 4°, pp. X., 154. 16 Taf., 1842.

7. ——. Entwicklungsgeschichte des Hunde-Eies. Braunschweig, 134 pp., 15 Taf., 1845.

8. ——. Entwicklungsgeschichte des Meerschweinchens. Giessen, 4°, pp. 56. Taf. VIII., 1852.

9. ——. Neue Beobachtungen zur Entwicklungsgechichte des Meerschweinchen. Abth. Bayr. Akad, cl. 2. X., 115–166. Taf. VII.–X., 1870.

10. BONNET, R. Beiträge zur Embryologie der Wiederkäuer gewonnen am Schafei. Arch. f. Anat. u. Entwick. Anat. Abth., 170–230. Taf. IX.–XI., 1884.

11. ——. Beiträge zur Embryologie der Wiederkäuer gewonnen am Schafei (Fortsetzung). Arch. f. Anat. u. Physiol. Anat. Abth., 1–106, Taf. I.–VI., 1889.

12. BRAUN, M. Die Entwicklung des Wellenpapageis (*Melopsittacus undulatus* Sh.) Thiel I.–II. Arb. zool., zool. Inst. Würzburg, V., 161–204; 205-341 Taf. VIII.–XIV., 1882.

13. CARIUS, FR. Ueber die Entwicklung der Chorda und der primitiven Rachenhaut bei Meerschweinen und Kaninchen. 8vo, pp. 33, Taf. I. Marburg (Inaug. Diss.), 1888.

14. COSTE, JEAN JACQUES. Histoire générale et particulière du Developpement des corps organisés. 4°, I., II. (une fascicule,) 1859. Atlas folio, 50 Pl. Paris. Victor Masson, 1847.

15. DISSE, J. Die Entwicklung des mittleren Keimblattes im Hühnerei. Arch. f. mikr. Anat., XV., 67–94. Taf. V., 1878.

16. ——. Die Enstehung des Blutes und ersten Gefässes im Hühnerei. Arch. f. mikr. Anat., XVI., 545–592. Taf. XXVI.–XXVIII., 1879.

17. DUVAL, M. Études sur la ligne primitive de l' embryon du poulet. Ann. Sci. Nat., 7 Sér. VII., Art. 7 48 pp., Pls. XIII.–XVIII., 1878.

18. ——. De la formation du Blastoderme dans l' oeuf d' oiseau. Ann. Sci. Nat. Zool., XVIII., Ser. 6, 1–208, Pls. I.–V., 1884.

19. Études histologiques et morphologiques sur les annexes des embryon d' oiseau. Robin's *Jour. Anat. et Physiol.*, XX., 201–241, Pl. IX.–XII., 1884.

20. FRASER, A. On the Inversion of the Blastodermic Layers in the Rat and Mouse. Proc. Roy. Soc. London, XXXIV., 430–437, 1883.

21. GASSER, E. Ueber den Primitivstreif bei Vogelembryonen. Sitzb. Ges. Beförd ges. Naturw. Marburg. 100–103, 1877.

22. ——. Der Primitivstreifen bei Vogelembryonen (Huhn and Gans). Schriften Ges. Beförd. ges. Naturw. Marburg., II., 1–98. Taf. I.–X., 1879.

23. HEAPE, WALTER. The development of the mole (*Talpa europea*). The formation of the germinal layers, and development of the medullary groove and notochord. *Q. J. M. S.*, XXIII., 412–452, Pl. XXVIII.–XXXI. Studies Morph. Lab. Cambridge, II., 29–75, Pl. VI.–IX., 1883.

24. HENSEN, VICTOR VON. Beobachtungen ueber die Befruchtung und Entwickelung des Kaninchens und des Meerschweinchens. Zeitschr. Anat. Entwick., I., 211–213; 353–423. Taf. VII.–XII., 1876.

25. HIS, WILHELM. Untersuchungen über die erste Anlage des Wirbelthierleibes. Die erste Entwickelung des Hühnchens im Ei. Leipzig, 237 pp., 12 Taf., 1868.

26. ——. Untersuchungen über die Entwicklung der Knochenfische, besonders über diejenige der Salmens. Z. f. Anat. u. Entwick., I., 1–39, Taf. I.–II., 1876.

27. ——. Ueber die Bildung der Haifischenembryonen. Zeitsch. f. Anat, u. Entwick., II., 108–124. Taf. VII., 1877.

28. ——. Neue Untersuchungen über die Bildung des Hühnerembryo. I. Arch. f. Anat. u. Phys., Anat. Abth., 112–187. Taf. V.–VI., 1877.

29. ——. Die Lehre von einem Bindesubstanzkeim (Parablast), Ruckblick nebst Besprechung einiger neuerer entwicklungsgeschlichtlicher Arbeiten. Arch. f. Anat. u. Phys., Anat. Abth., 12–108, 1882.

30. KOLLER, C. Beiträge zur Kenntniss des Hühnerkeims im Beginne der Bebrütung, Sitzb. Akad. Wiss., LXXX., III Abth., 316–329. Taf. I., 1879.

31. ——. Untersuchungen über die Blätterbildung am Hühnerkeim. Archiv. f. mikr. Anat., XX., 174–211. Taf. X.–XII., 1882.

32. KÖLLIKER, A. Ueber die Chordahölle und die Bildung der Chorda beim Kaninchen. Sitzb. Würzburg Phys. Med. Ges., 2–9, 1883.

33. KOLLMANN, J. Gemeinsame Entwickelungsbahnen der Wirbelthiere. His, Arch., 279–306. Taf. XII., 1885.

34. KUPFFER, C. Untersuchungen über die Entwicklung des Harn- u. Geschlechts-systems. Arch. f. mikr. Anat., II., 473–489. Taf. XXIV., 1866.

35. ——. Beobachtungen über die Entwicklung der Knochenfische. M. Schultze's Arch. f. mikr. Anat., IV., 209–272. Taf. XVI.–XVIII., 1868.

36. ——. Die Gastrulation an den Meroblastischen Eiern der Wirbelthiere und die Bedeutung des Primitivstreifens. Arch. f. Anat. u. Phys., Anat. Abth., 1–28, 139–154. Taf. I.–IV., VIII.–IX , 1882.

37. ——. Ueber active Betheiligung des Dotters am Befruchtungsacte bei Bufo variabilis und vulgaris. Sitzb. Münch. Acad., XII., 608–618, 1882.

38. ——. Das Ei von Arvicola arvalis und die Vereineintliche Umkehr der Keimblätter an demselben. Sitzb. math.–phys. Klasse, Münchener Akad., 621–637. 1 Taf., 1882.

39. ——. Die Gastrulation an den Meroblastischen Eiern der Wirbelthiere und die Bedeutung des Primitivstreifs. Fortsetzung. Arch. f. Anat. u. Physiol., Anat. Abth., 1–40. Taf. I.–II., 1884.

41. LIEBERKÜHN, N. Ueber die Keimblätter der Säugethiere. Gratulationschrift zur 50-jährigen Doctor-Jubelfeier des Herrn Hermann Nasse. Funzigjahe Doctor-Jubelfeier Herrn Hermann Nasse. Marburg, 4°, 26 pp. 1 Taf., 1879.

42. ——. Ueber des Chorda bei Säugethieren. Arch. f. Anat. u. Phys., Anat. Abth., pp. 399–438. Taf. XX.–XXI., 1882.

43. ——. Ueber die Chorda bei Säugethieren. Fortsetzung, Arch. Anat. Phys., Anat. Abth., pp. 435–452. Taf. XIX., 1884.

44. RABL, C. Theorie des Mesoderms. Morph. J. B., XV., 113–250. Taf. VII.–X., 1889.

45. RAUBER, A. Die erste Entwickelung des Kaninchens. Sitzb. Leipzig nat. forsch. Ges., 103, 1875.

46. ——. Primitivrinne und Urmund. Beitrag zur Entwicklungsgeschichte des Hühnchens. Morphol. Jahr., II., 550–576. Taf. XXXVII.–XXXVIII., 1876.

47. REICHERT, C. B. Beiträge zur Entwickelungsgeshichte des Meerschweinchens. Abhand. k. Akad. Wiss., Berlin, 97-216, 1862.

48. RÜCKERT, J. Ueber die Anlange des mittleren Keimblattes und die erste Blutbildung bei Torpedo. Anat. Anz., II. (4) 97–112; (6) 154–176, 1887.

49. RYDER, J. A. Development of the Silver Gar (*Belone longirostris*), with observations on the genesis of the blood in embryo fishes, and a comparison of fish ova with those of other vertebrates. Bull. U. S. Fish. Comm., I., 283–335. Pl. XIX.–XXI., 1881.

50. ——. The archistome theory. AMERICAN NATURALIST, XIX., 1115–1121, 1885.

51. ——. On the formation of the embryonic axis of the teleostean embryo of the blastoderm. AMERICAN NATURALIST, XIX., 614–615, 1885.

52. SCHÄFER, E. A. Description of a mammalian ovum in an early condition of development. Proc. Roy. Soc., XXIV., 399–403. Pl. X., 1876.

53. SCHWARZ, D. Untersuchungen des Schwanzendes bei Embryonen der Wirbelthiere. Zeitschr. wiss. Zool., XLVIII., Aft. 2, 191–224. Taf. XII.–XIV., 1889.

54. SEMPER, CARL. Die Verwandschaft beziehungen der gegliederten Thiere, III., Strobilation und Segmentation. Semper's Arbeit. zool., zool. Instit. Würzburg., III., 115–404. Taf. V.–XV., 1876.

55. SELENKA, E. Studien über Entwicklungsgeschichte der Thiere, 1 Heft. Keimblätter und Primitivorgane der Maus. Weisbaden, Kreidel 4°, pp. 32. Taf. IV., 1883.

56. ——. Studien über Entwicklungsgeschichte der Thiere, III., Die Blätterumkehrung im Ei der Nagethiere. Wiesbaden, Kreidel, 4°, pp. 99. Taf. XI.–XVI., 1884.

57. ——. Studien über Entwickelungsgeschichte der Thiere, Heft. IV., Das Opossum (*Didelphys virginiana*), 1 Hälfte, 4°, pp. 101–132. Taf. IX., 1886.

58. STRAHL, H. Ueber den Canalis-myelo-entericus der Eidechse. Marburger Sitzb., 37–41, 1880.

59. ——. Ueber die Entwicklung der Allantois der Eidechse. Marburger Sitzb., 47–49, 1880.

60. ——. Zur Entwicklung des canalis-myelo-entericus der Eidechse. Marburger Sitzb., 54–55, 1880.

61. ——. Beiträge zur Entwicklung von Lacerta agilis (aus dem anatomischen Institute zu Marburg). Arch. f. Anat. u. Phys., Anat. Abth., 242-278, 1882.

62. ——. Beiträge zur Entwickelung der Reptilien. His, Arch., Anat. Abth., pp. 1–43. Taf. I., 1883.

63. ——. Zur Bildung der Cloake des Kaninchenembryo. Arch. Anat. Phys., Anat. Abth., 156–168. Taf. IV., 1886.

64. WALDEYER, W. Bemerkungen ueber die Keimblätter und die Primitivstreifen bei der Entwicklung der Hühnerembryo. Z. rat. Med. XXXIV., 159–178. Taf. X.–XI., 1869.

65. ——. Archiblast and Parablast. Arch. f. Mikr. Anat. XXII., 1-77, 1883.

66. WELDON, A. B. Note on the early development of *Lacerta muralis*, *Q. J. M. S.*, XXIII., 134-144, Pls. IV.-VI., 1883.

67. WHITMAN, C. O. The Embryology of Clepsine. *Quarterly Journ. Microscop. Science*, N. S., XVIII., Pls. XII.-XV., 1878.

68. ——. A rare form of the blastoderm of the chick, and its bearing on the question of the formation of the vertebrate embryo. *Q. J. M. S.*, XXIII., N. S., pp. 375-397, Pls. XXIV.-XXV., 1883.

69. ZUMSTEIN, J. J. Ueber das Mesoderm der Vogelkeimsscheibe (Huhn und Ente), 8 vo., p. 56. Bern (Inaug. Diss.), 1887.

THE HISTORY OF GARDEN VEGETABLES.

BY E. L. STURTEVANT.

(Continued from page 646.)

SKIRRET. *Sium sisarum* L.

THIS plant seems to have been unknown to the ancients; certainly no mention can be found of an umbillifer with grouped and divergent roots, the peculiarity of the Skirret alone among European cultivated plants of this order. In the sixteenth century the name *siser* was applied to the carrot as well as to the Skirret, as by Camerarius[1] who describes *siser*, the *sisaron* of the Greeks, as a correct Skirret, and under *siser alterum*, Italian *carota bianca*, German *gierlin*, Spanish *chirivias*, French *chervy* or *girolles* or *carottes blanche*, as a carrot, and other illustrations of this period and earlier might be given. Fuchsius[2] in

[1] Camerarius. Epitome, 1586, 226, 227.

[2] Fuchsius. De Stirp., 1542, 752.

1542 figures the Skirret, as does also Ruellius[3] in 1550, Tragus[4] in 1552, and many others after this time, and it was well known in Europe as a plant of culture at this period. It perhaps came, says Decandolle,[5] from Siberia to Russia, and from thence into Germany. It is not named by Turner[6] in 1538, but is in 1551,[7] and in 1570 the Adversaria gives the English name as *scyrret.* It was in American gardens in 1775.[8] There are no varieties described.

The modern names of the *Skirret* are: In France, *chervis, chirouis, giroles;* in Germany, *Zuckerwurzel;* in Flanders, *suikerwortel;* in Denmark, *sukkerrod;* in Italy, *sisaro;* in Spain, *chirivia tudesca;* in Portugal, *cherivia;*[9] in Scotland, *crummock;*[10] in India, *cheena aloo;*[11] in Japan, *muskago nisin sjakuna.*[12]

The ancient names, as given by J. Bauhin,[13] are: For Germany, *gierlin, gierlen, geyerlein, gorlin, gerlin, klingei, rublin, garten rapunzel, zam rapunzel, klein morellen, klingel mohren, girgele, girgeln,* and, above all others, *zucker wurtzel;* in Belgian, *suycker wortelen, serillen;* in French, *esthervis, chervits, chervy, gyroles;* in Italy, *sisaro;* in Spain, *cherivias, chirivias, chirimas;* in English, *scyrret.*

SNAILS. *Medicago scutellata* All.

This plant is not edible, but like the caterpillar-plant is grown on account of the singular shape of its seed-vessels. It was in Belgian and German gardens preceding 1616,[14] and in American gardens in 1863 or before.[15]

Called in France, *limacon;* in Germany, *schnirkel-schnecke, schneckenklee;* in Spain, *caracol.*[16]

[3] Ruellius. Diosc., 1550, 239.
[4] Tragus. De Stirp., 1552, 911.
[5] Decandolle. Orig. Des Pl. Cult., 31.
[6] Turner. Libellus, 1538.
[7] Bauhin. Pin., 1623, 155.
[8] Romans. Nat. Hist. of Fla., I., 115.
[9] Vilmorin. Les Pl. Pot., 87.
[10] McIntosh. Book of the Gard., II., 229.
[11] Speede. Ind. Handbook of Gard.
[12] Thunberg. Jap., 118.
[13] J. Bauhin. Hist., 1651, III., pt. 2, 154.
[14] Dodonæus. Pempt., 1616, 575.
[15] Burr. Field and Gard. Veg., 1863, 398.
[16] Vilmorin. Les Pl. Pot., 321.

SOJA BEAN. *Soja hispida* Moench.

This leguminous plant, although popular in eastern countries, can scarcely be expected to obtain a foot-hold in European or American gardens. According to Bretschneider,[17] a Chinese writing of 163–85 B. C. records that Shen nung, 2800 B. C., sowed the five cereals, and another writing of A. D. 127-200 explains that these five cereals were rice, wheat, *Panicum italicum*, *P. miliaceum*, and the Soja. The same are also mentioned in the "Classics." The use of this bean as a vegetable is also recorded in authors of the fifth, fourteenth, and sixteenth centuries. The first mention of Soja that I note is by Kæmpfer,[18] who was in Japan in 1690, and in his account of his travels he gives considerable space to this plant. It also seems to be mentioned by Ray[19] in 1704. It is much cultivated in China and Cochinchina.[20] There are a large number of varieties,—"as many as you have of beans," as a Japanese friend informed me. Seed was brought from Japan to America by the Perry Expedition on its return, and were distributed from the U. S. Patent Office[21] in 1854. I have since then received some of the seed from the South under the name of the cow-pea. In France the seed received distribution in 1855.[22] In 1869 Martens[23] describes thirteen varieties.

The *Soja Bean* is called in France, *soja, pois oleagineux de la Chine;* in Germany, *soja-bohne;*[24] in Japan, *daidsu* or *mame*, the send *miso*;[25] in China, *yeou-teou*.[22]

In some of its varieties this bean may be found useful for forage purposes, or perhaps for field culture.

SORREL. *Rumex* sp.

The Sorrels are much used in many parts of Europe, but they do not seem to be popular in English-speaking countries. A

[17] Bretschneider. Bot. Sin., 75, 78, 52, 59.
[18] Kæmpfer. Amoen., 1712.
[19] Ray. Hist. Suppl., 1704, 438.
[20] Loureiro. Fl. Cochinch., 441.
[21] U. S. Pat. Of. Rept., 1854, XV.
[22] Paillieux. Le Soya, 1881, 5.
[23] Martens. Die Gartenbohne, 1869, 103-5.
[24] Vilmorin. Les Pl. Pot., 549.
[25] Thunberg. Jap., 282.

number of species have been brought under culture, but the varieties referred to *Rumex acetosa*, *R. montanus*, and *R. scutatus* are now the only ones described by Vilmorin as under European vegetables.

Rumex acetosa L.

This species is very extensively used in France, and has four varieties.[26] It was formerly much cultivated in England for its leaves, which were used as spinach or in salads, and are agreeably acid. It is mentioned in nearly all the earlier botanies, and by Gerarde[27] in 1597, as under culture in England, who also figures the blistered variety. It is spoken of in nearly all the later writers on garden subjects, and was in common use in 1807,[28] but in 1874 is said to have been for many years entirely discarded, the French Sorrel having usurped its place.[29] The broad-leaved form was in American gardens in 1806.[30] This plant is in great favor with the northern natives, as the Laplanders,[31] the Hebrideans,[32] etc., and in its varieties is largely cultivated.

The *common sorrel*, *sorrel*, or *green sauce*[33] is called in France, *oseille commune*, *aigrette*, *oseille longue*, *surelle*, *surette*, *vinette*; in Germany, *Sauerampfer*, *Sauerling*; in Flanders and Holland, *zuring*; in Denmark, *almindelig syre*; in Italy, *acetosa*, *acetina*, *erba perpetua*; in Spain, *acedera*, *agrella*; in Portugal, *azedas*;[26] in Greece, *xunethra*, *zinitra*, *oxalithi*;[34] in the Mauritius, *oseille*;[35] in India, *oovlaeeta chooka*.[36]

Rumex scutatus L.

This species is mentioned in England by Gerarde[27] in 1597, but he does not indicate its general cultivation; he calls it oxalis

[26] Vilmorin. Les Pl. Pot., 393.
[27] Gerarde. Herbal., 1597, 319.
[28] Miller's Dict., 1807.
[29] Booth. Treas. of Bot., 1874.
[30] McMahon. Am. Gard Kal., 1806, 320.
[31] Lightfoot. Fl. Scot., I., 191.
[32] *Jour. of Agr.*, II., 379.
[33] Johnson. Useful Pl., 222.
[34] Pickering. Ch. Hist., 365.
[35] Bojer. Hort. Maur., 272.
[36] Speede. Ind. Handb. of Gard., 154.

franca seu romana. It is more acid than the preceding species, and has displaced it largely from English culture. It is mentioned by many of the early botanists, and is under extensive culture in continental Europe.[37] It was in American gardens in 1806,[30] but is now scarcely cultivated, as would seem from its absence from our seed lists.

French sorrel,[38] *round-leaved sorrel*,[39] *buckler-shaped sorrel*,[29] or *Roman sorrel*[37] is called in France, *oseille ronde, petite oseille;* in Germany, *romischer sauerampfer;* in Italy, *acetosa romana, acetosa tonda*.[26]

Rumex montanus Desf.

This species occurs in French gardens under two varieties, the green-leaved and the crimped-leaved. The wild form, *R. arifolius* L., is often met with in France. In 1863 Burr[40] describes it among American garden esculents. In India it is said by Firminger[41] to be an excellent ingredient to use abundantly in soups, and to serve to impart a peculiarly fine flavor to omelettes.

Mountain sorrel,[40] or *maiden sorrel*,[38] is called in France, *oseille vierge, oseille sterile;* in Italy, *acetosa vergine*.[26]

Rumex alpinus L.

A species sometimes grown in France, but which does not appear to have entered American culture. It was grown in England by Gerarde in 1597 for use in "physicke," and is described as cultivated there in Miller's Dictionary, 1807. It is eaten as a herb in China.[42]

Pyrenean sorrel[38] is called in France, *oseille des Alpes, oseille des Pyrnees*.

Rumex pulcher L.

This species is said to be planted in gardens in France for use as a pot-herb, but the leaves to become very hard in summer.[43] It is, however, scarcely to be considered a garden plant.

[37] McIntosh. Book of the Gard., II., 139.
[38] Vilmorin. The Veg. Gard., 526.
[39] Mawe. Gard., 1778.
[40] Burr. Field and Gard. Veg., 308.
[41] Firminger. Gard. in Ind., 142.
[42] Smith. Mat. Med. of China, 87.
[43] Flore Nat. et Econ., etc., Pt. II., p. 497.

Rumex sanguineus L.

This weed of waste and cultivated grounds of America is mentioned, under the name Bloodwort, by Josselyn,[44] about the middle of the seventeenth century, as introduced. As Gerarde[45] in 1630 says it was sown in his time for a pot-herb in most gardens, and as Ray[46] in 1686 also says it was planted in gardens as a vegetable, we may believe that it was in former use in colonial gardens in Massachusetts. Its use is as a spinage, and for this purpose the leaves of the wild plant are occasionally collected at the present time.

Bloody-veined dock is the name under which the wild plant is now known.

SOUTHERNWOOD. *Artemesia abrotanum* L.

This aromatic plant is inconsiderably cultivated for its agreeable taste and tonic properties.[47] To some people its fragrance is very grateful. It is cultivated in most parts of China for the use of the young shoots made into cakes with meal.[48] It was apparently known to the ancients, but the references are not as clear as might be. It was described as under cultivation by the herbalists of the sixteenth century, and Turner[49] in 1538 gives its English name as *Suthernwoode.* In 1859 Gray[50] says it is found in some American gardens.

Southernwood, called in Anglo-Saxon, *sæthrenewudu* or *suthernwude,*[51] is called in France, *aurone, aurone des jardins, aurone male, citronelle, garde-robe, herbe royale, vrogne;* in Denmark, *ambra;* in Italy, *abrotano, abrotino;* in Greece, *pikrothanos;* in Egypt, *semsæk,* or *msæk,* or *meskeh;*[51] in China, *yin-chin-hau.*[48]

SPINAGE. *Spinacea oleracea* L.

This plant was unknown to the ancient Greeks and Romans, but appears to have been early used by the Arabs, and by the

[44] Josselyn. Rar., 114.
[45] Gerarde. Herb., 1633, 390.
[46] Ray. Hist., 1686, 174.
[47] Decaisne & Naudin. Man., IV., 239; Vilmorin. Les Pl. Pot., 28.
[48] Smith. Mat. Med. of China, 25.
[49] Turner. Libellus, 1538.
[50] Gray. Man. of Bot., 1859, 228.
[51] Pickering. Ch. Hist., 258.

Moors carried to Spain, from which it gradually spread to the rest of Europe.[52] The first notice I find is its occurrence in China in the seventh or eighth century,[53] and one of its names is *Po-ssv-ts'ao*, Persian herb.[54] In the Nabathean agriculture in Spain, in the twelfth century, it is called by *Ibn-al-awan*, the prince of vegetables.[55] Albertus Magnus,[56] who lived in Bavaria in the thirteenth century, describes the *spinachia* with spiny seed. Ammonius,[57] a Bavarian physician writing in 1539, says it was mentioned by Avicenna, an Arab author born in Persia in 981, and is perhaps the *aspenach* of Serapio, another Arab author of the same period. In 1536 Ruellius says it was called *spinacia* in France, and *spinachia* by the modern Greeks. In England it is mentioned by Turner[58] in 1538, who calls it *Atriplex hispaniensis* of some, *spinachia* of the English. It was new in Italy in 1558, according to Matthiolus.[59] We thus find its presence universal in Europe in the early part of the sixteenth century. Indeed its use has become for some time so extended as to supplant many other vegetables formerly grown as pot herbs.

Two races are now known in our gardens; the one with prickly seed, and the other with smooth seed. These have been described as species.

Spinacia spinosa Moench.

Spinachia. Alb. Mag., 13th Cent., Jessen Ed., 563; Fuchsius, 1542, 666, cum ic; Dod., 1616, 619, cum ic.

Binetsch, Spinat, Spinacia. Roszlin, 1550, cum ic.

Olsus hispanicus. Trag., 1552, 325, cum ic.

Spinacia. Matth., 1570, 342, cum ic; Lob. Obs., 1576, 129, cum ic., 1591; ic., 1591, I., 257; Lugd., 1587, 544, cum ic.; Ger., 1597, 260, cum ic.

[52] Targioni-Tozzetti. Hort. Trans., 1854, 148.
[53] Bretschneider. Bot. Sin., 79.
[54] Bretschneider. On the Study, etc., 16.
[55] Heuze. Les Pl. Alim., I., IV.
[56] Albertus Magnus. De Veg., Jessen Ed., 1867, 563.
[57] Ammonius. Med. Herb., 1539, 323.
[58] Turner. Libellus, 1538.
[59] Matthiolus. Com., 1558, 246.

Spanachum. Cam. Epit., 1586, 245, cum ic.

Lapathum hortense alterum, seu spinacia semine spinoso. Bauh. Phytopin., 1596, 183.

Spinachia mas. J. Bauhin, 1651, II., 964, cum ic.

Spinacia oleracea L. var. A. Lin. Sp., 2d ed., 1456.

Epinard d'Angleterre. Vilm., 1883, 203.

Large Prickly or Winter Spinage. Vil., 1885, 533.

Spinacia inermis Moench.

Spinachia nobilis. Tragus, 1552, 324.

Lapathum hortense alterum spinacia, semine non spinoso. Bauh. Phytopin., 1596, 184.

Spinacia II. Ger., 1597, 260.

Spinachia fœmina. J. Bauh., 1651, II., 964.

Spinachia semine non pungente, folio majore rotundiore. Ray, 1686, 162; Chabr., 1677, 303 cum ic.

Spinacia glabra. Mill. Dict., 1733.

Spinacia oleracea, L. var. B. Lin. Sp., 1762, 1456.

Epinards a graine ronde. Vil., 1883, 204.

Round-Seeded Spinage. Vil., 1885, 534.

Spinage was in American gardens in 1806.[60] There is but one variety of the prickly-seeded described by Vilmorin,[61] and five of the smooth-seeded form.

Spinage is called in France, *epinard;* in Germany, *spinat;* in Flanders and Holland, *spinazie;* in Denmark, *spinat;* in Italy, *spinaccio;* in Spain, *espinacia*; in Portugal, *espinafre;*[61] in Norway, *spinat.*[62]

In Arab, *sebanakh,*[63] *tæktera,*[64] *ispanaj,*[65] *isfanadsch,*[66] *esbanach;* in China, *po-ling, po-ts'ai, po-ssv-ts'ao;*[67] in Hindustani, *sag-paluk;* in Persia, *ispanaj.*[65]

[60] McMahon. Am. Gard. Kal., 1806.
[61] Vilmorin. Les Pl. Pot., 202.
[62] Schubeler. Culturpfl., 80.
[63] Delile. Fl. Æg. Il.
[64] Forskal. Fl. Æg.—Arab., XCIII.
[65] Birdwood. Veg. Prod. of Bomb., 69, 177.
[66] Decandolle. Geog. Bot., 846.
[67] Bretschneider, l. c.

SQUASH, PUMPKIN, AND GOURD.

The Squash.

The word squash seems to have been derived from the American aborigines, and in particular from those tribes occupying the northeastern Atlantic coast, and seems to have been originally applied to the summer squash, as by Wood,[68] when he says, "In summer, when their corn is spent, *isquotusquashes* is their best bread; a fruit much like a pumpkin." Roger Williams[69] writes the word "*Askutasquash*,—their vine apples,—which the English, from them call *squashes;* about the bigness of apples of several colors." Josselyn[70] gives also a new form to the word, writing "*Squashes*, but more truly *squoutersquashes*, a kind of mellon or rather gourd; for they sometimes degenerate into gourds. Some of these are green; some yellow; some longish, like a gourd; others round, like an apple; all of them pleasant food, boyled and buttered, and seasoned with spice. But the yellow squash—called an apple squash (because like an apple), and about the bigness of a pome water—is the best kind." This apple squash, by name at least, as also by the description so far as applicable, is even now known to culture, but is rarely grown on account of its small size.[71] Van der Donck, after speaking of the pumpkins of New Netherlands (1642–53), adds, "The natives have another species of this vegetable peculiar to themselves, called by our people *quaasiens*, a name derived from the aborigines, as the plant was not known to us before our intercourse with them. It is a delightful fruit, as well to the eye on account of its fine variety of colors, as to the mouth for its agreeable taste. . . . . It is gathered early in summer, and when it is planted in the middle of April, the fruit is fit for eating by the first of June. They do not wait for it to ripen before making use of the fruit, but only until it has attained a certain size. They gather the squashes, and immediately place them on the fire without any further trouble."[72] In 1683 Worlidge[73] uses the

[68] Wood. New Eng. Prosp., Pt. II., c. 6.
[69] R. Williams. Key, etc., 222.
[70] Josselyn. Rar., p. 89.
[71] Burr. Field and Gard. Veg., 1863, 207.
[72] Quoted from A. Gray, *Am. Jour. of Sci.*, May, 1883, p. 377.
[73] Systema Horticulturæ, by J. W. Gent, p. 211.

word squash, saying, "There are lesser sorts of them [pompeons] that are lately brought into request that are called *squashes*, the edible fruit whereof, boyl'd and serv'd up with powdered beef, is esteemed a good sawce," and Kalm[74] in his Travels says distinctly that "The squashes of the Indians, which now are cultivated by Europeans, belong to those kind of gourds which ripen before any other." These squashes of New England were apparently called sitroules by Champlain[75] in 1605, who describes them "as big as the fist." Lahontan[76] in 1703 calls the squashes of southern Canada *citrouilles*, and compares with the melon, which indicates a round form.

These "squashes," now nearly abandoned in culture, would seem to be synonymous, in some of their varieties at least, with the macock of Virginia and the Virginian watermelon described in Gerarde's Herbal[77] as early as 1621.

The Perfect Gem Squash, introduced in 1881, seems to belong to this class, and is very correctly figured by Tragus in 1552,[78] who says they are called *Mala indica*, or in German *Indianisch opffel*, and occur of four colors, saffron yellow, creamy white, orange, and black. He also gives the name *Summer opffel*, which indicates an early squash, and the names *zucco de Syria* and *zucco de Peru*, which indicate a foreign origin. To identify this claimed recent introduction as synonymous with Tragus' *Cucumis, seu zucco marinus* may seem rather improbable. The Perfect Gem and Tragus plant have the following points in common: Fruit of like form and size; so also the leaf, if the proportions between leaf and fruit as figured may be trusted; seed sweet in both; color alike, "Quae candida foris and quae ex pallido lutea sunt poma." The plants are runners in both. Compare also with the description of the Maycock, and it appears to be the same in all but color. A curious instance of survival seems to be here noted, or else the regaining of a lost form through atavism.

[74] Kalm. Trav., 1748, I., 140.
[75] Champlain. Voyages. Prince Coll., pp. 64, 75.
[76] Lahontan. Nouv. Voy., II., 61.
[77] Gerarde. Herb., 1633, pp. 919, 921.
[78] Tragus. De Stirpium, 1552, 835.

A careful comparison with the figures and the description given would seem to bring together as synonyms:

Cucumis marinus. Fuchs., 1542, 699; Roszlin, 1550, 116.

Cucumis vel zucco marinus. Trag., 1552, 835.

Cucurbita indica rotunda. Lugd., 1587, I., 116.

Pepo rotundus minor. Dod., 1616, 666.

Pepo minor rotundus. Bodæns, 1644, 783.

Cucurbite folio aspero, sive zucchæ. Icon., IV., Chabr., 1673, 130.

The Maycock. Ger., 1633, 919.

The Perfect Gem, 1881.

The distinctions between the various forms of Cucurbits seem to have been kept in mind by the vernacular writers, who did not use the words pumpion, gourd, etc., as synonyms. Thus in 1535 Cartier[79] mentions as found among the Indians of Hochelega, now Montreal, "pompions, gourds." In 1586 Heriot[80] mentions in Virginia "pompions, melons, and gourds," and Captain John Smith[81] pumpions and macocks; Strachey,[82] who was in Virginia in 1610, mentions macocks and pumpions as differing. "Pumpions and gourds" are named by Smith[83] for New England in 1614. In 1648, at the mouth of the Susquehanna, mention is made of "symnels and maycocks."[84]

The word squash in its early use, we may hence conclude, applied to those varieties of Cucurbits which furnished a summer vegetable, and was carefully distinguished from the pumpkin. Kalm[85] in the eighteenth century distinguishes between pumpkins, gourds, and squashes. The latter are the early sorts; the gourd includes the late sorts useful for winter supplies; and the pompion or melon, the latter name and contemporary use giving the impression of roundness and size; and Jonathan Carver[86] soon after gives indication of the confusion now existing in the

[79] Cartier. Pink. Voy., XII., 656.
[80] Pink. Voy., XII., 596.
[81] Pink. Voy., XIII., 33.
[82] Strachey. Trav. into Va., 72.
[83] Smith. Desc. of New Eng., II., 16.
[84] A Description of New Albion. Force Coll., II.
[85] Kalm. Trav., 1770–1, I., 140.
[86] Carver. Travels in the Northwest in 1776, p. 211.

definition of what constitutes a pumpkin and a squash when he says, "the melon or pumpkin, which by some are called squashes," and he names among other forms the same variety, the crook-neck, or crane-neck as he calls it, which Kalm classed among gourds.

At the present time the word squash is only used in America, gourds, pumpkins, and marrows being the equivalent English name,[87] and the American use of the word is so confusing that it can only be defined as applying to those varieties of Cucurbita which are grown in gardens for table use, while the word pumpkin applies to those varieties grown in fields for stock purposes, and the word gourd to those ornamental forms with a woody rind and bitter flesh, or to the Lagenaria.

This class of Cucurbits belongs to *Cucurbita pepo*, Cogn. in in DC. Monog., II., p. 545.

Other forms distinctively known at present as squashes are added in proper sequence.

The form of Cucurbit now so generally known as *Bush* or *Summer Squash* is correctly figured in 1673 by Pancovius,[88] under the name of *Melopepo clypeatus* Tab. What may be the fruit was figured by Lobel[89] in 1591, and by Dodonæus[90] in 1616, and similar fruit with the vine and leaf by Dalechamp in 1587,[91] Gerarde[92] in 1597, Dodonæus in 1616, and by J. Bauhin[93] in 1651. By Ray[94] in 1686 it is called in the vernacular "*The Buckler* or *Simnel-Gourd*." This word cymling or cymbling, in use at the present day in the Southern States for the Scalloped Bush Squash in particular, I find used in 1648 in "A Description of New Albion," but spelled Symnels. Jefferson[95] wrote the word "cymling." In 1675, Thomson, in a poem entitled New England's Crisis, uses the word "cimnel," and distinguishes from

[87] The Vegetable Garden. Vilmorin-Andrieux. Trans. by W. Robinson. London, 1885.
[88] Pancovius. Herbarium, 1673, No. 920.
[89] Lobel, ic., 1591, I., 642.
[90] Dodonæus. Pempt., 1616, 667.
[91] Hist. Gen. Lugd., 1587, I., 618.
[92] Gerarde. Herbal, 1597, 774.
[93] J. Bauhin. Hist., 1651, II., 224.
[94] Ray. Hist., 1686, I., 648.
[95] Jefferson's Notes on Virginia, 1803.

the pumpkin. Whence the origin of the word I find no clue, but it was very possibly of aboriginal origin, as its use has not been transferred to Europe. In England it is called Crown Gourd and Custard Marrow; in the United States generally the Scalloped Squash, from its shape; or locally, cymling or pattypan,—this latter name derived from the resemblance to a crimped pan used in the kitchen for baking cakes. It was first noticed in Europe, so far as I can ascertain, in the sixteenth century, and has the following synonymy:

Cucurbita laciniata. Lugd., 1587, I., 618.

Melopepo latior clypeiformis. Lob., ic., 1591, I., 642.

Pepo maximum clypeatus. Ger., 1597, 774.

Pepo latus. Dod., 1616, 666.

Pepo latiorus fructus.. Dod., 1616, 667.

Cucurbita clypeiformis sive Siciliana melopepon latus a nonnullis vocata J. B., 1651, II., 224. (First known to him in 1561.)

Melopepo clypeatus. Pancov., 1653, n. 920.

The Buckler or Simnel-Gourd. Ray., Hist., 1686, I., 648.

Summer Scalloped.

This forms belongs to the *Cucurbita melopepo*, Lin. sp., ed. 2, p. 1435, *C. pepo*, Cogn., l.c.

The Bush Crookneck is also called a squash. Notwithstanding its peculiar shape and usually warted condition, it does not seem to have received much mention by the early colonists, and to have escaped the attention of the pre-Linnean botanists, who were so apt to figure new forms. The most we know is that Summer Crooknecks appeared in our garden catalogues in 1828,[96] and it is perhaps referred to by Champlain in 1605. It is now recommended in France rather as an ornamental plant than for kitchen use.[97] This form belongs to *Cucurbita pepo* Naudin, Ann. Sc. Nat., Ser. 4, V., 6, p. 29.

The *Winter Crookneck* squash seems to have been first recorded by Ray,[98] who received the seeds from Sir Hans Sloane and planted them in his garden, and this was the variety now known

[96] Thorburn's Cat.

[97] Vilmorin. Les. Pl. Pot., 1883, 184.

[98] Ray. Hist., 1686, I., 642.

as the Striped. It has apparently been grown in New England from the earliest times, and often attains a large size. Josselyn[99] refers to a Cucurbit that may be this, the fruit "longish like a gourd," the very comparison made by Ray. Kalm[100] mentions a winter squash in New Jersey called "crooked neck," and Carver[101] speaks of "crane-necks" being preserved in the West for winter supply. A sub-variety, the Puritan,[102] answers to Beverley's[103] description of a form which he calls Cushaw, an Indian name recognizable in the Ecushaw of Heriot, 1586. This form was grown at the New York Agricultural Experiment Station in 1884 from seed obtained from the Seminoles of Florida, and appears synonymous with the Neapolitan, to which Vilmorin applies the French synonym of Courge de la Florida.

This form of squash belongs to *Cucurbita moschata*, Cogn., l.c., p. 546.

The *Pine Apple* squash, in its perfect form, is of a remarkably distinctive character, on account of its acorn-shape and regular projection. As grown, however, the fruit is quite variable, and can be closely identified with the *Pepo indicus angulosus* of Gerarde,[104] and is very well described by Ray[105] in 1686. This variety was introduced in 1884 by Landreth, and, as I am informed, the seed came originally from Chili. It is a winter squash, creamy white when harvested, of a deep yellow at a later period. It belongs to *Cucurbita pepo*, Cogn., l.c.

The *Turban squash* is easily recognized by its special form, to which it is indebted for its name. In France this is classed with the Giraumons, and one of its trivial names is *Citrouille iroquoise*. It is possibly the Chilian mamillary Indian gourd of Molina[106] in 1787, described as with spheroidal fruit with a large nipple at the end, the pulp sweet and tasting like the sweet potato. In 1856

[99] Josselyn. Rar., 89.
[100] Kalm. Trav., 1670, I, 347.
[101] Carver. Trav., 1776.
[102] Burr. Field and Gard. Veg., 1863, p. 221.
[103] Beverley. Hist. of Va., 1705, 124.
[104] Gerarde. Herbal, 1597, 774.
[105] Rav. Hist., 1686, I., 641.
[106] Molina. Hist. of Chili, 1808, I., 93.

Naudin[107] describes Le Turban Rouge, and Le Turban Nouveau du Bresil, the latter of recent introduction from South America. Its description accords with the *Cucurbita clypeiformis tuberoso* and *verrucoso*, seen by J. Bauhin[108] in 1607. The Zapillito, from Brazil, advertised by Gregory in 1880, and said by Vilmorin to have reached France from South America about 1860, resembles the Turban squash in shape. This evidence, such as it is, points to South America as the starting point of this form.

It belongs to *Cucurbita maxima*, Cogn., l.c.

The squashes of our markets, par excellence, are the *Marrows* and the *Hubbard*, with other varieties of the succulent stemmed. These found representation in our seed catalogues in 1828,[109] in the variety called Com. Porter's Valparaiso, and which was brought from Chili shortly after the war of 1812. In the *New England Farmer*, Sept. 11., 1824, notice is made of a kind of melon squash or pumpkin, of moderate size, from Chili, a few seeds being received in Boston, and which is possibly the Valparaiso. The Hubbard squash is said by Gregory, its introducer in 1857, to be of unknown origin, but to resemble a kind which was brought by a sea captain from the West Indies. The *Marblehead*, also introduced by Mr. Gregory and distributed in 1867, is said directly to have come from the West Indies. The *Autumnal Marrow* or *Ohio* was introduced in 1832, and exhibited at the rooms of the Massachusetts Horticultural Society.

This class is to be referred to *Cucurbita maxima*, Cogn., l.c., and does not appear in any of the figures or descriptions of the herbalists, so far as we can ascertain, except as hereinafter noted for Lobel.

The Pumpkin.

The word *pumpkin* is derived from the Greek *pepon*, Latin *pepo*. In the ancient Greek it was used by Galen as a compound to indicate ripe fruit, as *sukuopepona*, ripe cucumber, as also by Theophrestus *peponas*, and Hippocrates *sikuon peponia*.[110]

[107] Naudin. Ann. Des. Sc. Nat., 4th ser., VI., p. 20.
[108] J. Bauhin. Hist., 1651, II., 227.
[109] Thorburn's Cat.
[110] See Bodæus a Stapel. Theoph., 1644, 781.

The word *pepo* was transferred in Latin to large fruit, for Pliny[111] says distinctly that "*cucumeres*," when of excessive size, are called "*pepones*." By the commentators the word *pepo* is often applied to the melon. Fuchsias[112] in 1542 figures the melon under the Latin name *pepo*, German *pfeben;* and Scaliger[113] in 1566, Dalechamp[114] in 1587, and Castor Durante[115] in 1617 apply this term *pepo* or *pepon* likewise to the melon. The derivatives from the word *pepo* appear in the various European languages, as follows:

Belgian: *pepoenem*, Lob. Obs., 1576; *pompoen*, Marcg., 1648, Vilm., 1883.

English: *pepon*, Lyte, 1586; *pompon*, Lyte, 1586; *pompion*, Ger. 1597; *pumpion*, J. Smith, 1606; *pumpkin*, Townsend, 1726.

French: *pompons*, Ruel., 1536; *pepon*, Dod. Gal., 1559.

Italian: *popone*, Don, 1834.

Swedish: *pumpa*, Tengborg, 1764; *pompa*, Webst. Dict.

In English the word *melon* and *million* was early applied to the pumpkin, as by Lyte in 1586, Gerarde in 1597 and 1633, and by a number of the early narrators of voyages of discovery. Pumpkins were called gourds by Lobel in 1586, and by Gerarde in 1597, and the word gourd is at present in use in England to embrace the whole class, and is equivalent to the French courge. In France the word courge is given by Matthiolus in 1558, and Pinæus in 1561, and seems to have been used as applicable to the pumpkin by early navigators, as by Cartier in 1535. The word courge was also applicable to the Lagenaria in 1536, 1561, 1586, 1587, 1597, 1598, 1617, 1651, 1673, 1772, and is now shared with the pumpkin and squash in 1883.

Our earlier travelers and historians often recognized in the pumpkin a different fruit from the courge, the gourd, or the melon. Cartier, on the St. Lawrence in 1584 discriminates by using the words "gros melons, concombres, and courges 35,"[116] or in a

[111] Pliny, lib. XIX., c. 23, Grandsagne Ed., p. 196.
[112] Fuchsius. De Stirp., 1542, 701.
[113] Scaliger. In Lib. de Plant. Arist., 1566, 79, 110.
[114] Hist. Gen. Lugd., 1587, I., 623.
[115] Castor Durante. Herb. Novo., 1617.
[116] Cartier. Bref. Recit., etc., 1545. Reimpr. Tross., 1863.

translation "pompions, gourds, cucumbers."[117] In 1586 a French name for what appears to be the summer squash is given by Lyte as concombre marin. With this class we may interpret Cartier's names into "gros melons" pumpkins, "concombres" summer squashes, and "courge" winter crooknecks, as the shape and hard shell of this variety would suggest the gourd or Lagenaria. In 1586 Heriot, in Virginia,[118] names "macokner, according to their several forms, called by us pompions, melons, and gourds, because they are of the like forms as those kinds in England. In Virginia such of several forms are of one taste, and very good, and do also spring from one seed. They are of two sorts: one is ripe in the space of a month, and the other in two months." Heriot apparently confuses all the forms met with with the macock, which, as we have shown in our notes on squashes, appears identical with the type of the Perfect Gem Squash, or the *Cucumis marinus* of Fuchsius. The larger sorts may be his pompions, the round ones his melons, and the cushaw type his gourds, for, as we shall observe, the use of the word pompion seems to include size, and that of gourd, a hard rind. Acosta[119] indeed speaks of the Indian pompions in treating of the large-sized fruits. Capt. John Smith,[120] in his Virginia, separates his pumpions and macocks, both planted by the Indians amongst their corn, and in his description of New England in 1614 speaks of pumpions and gourds. This would seem to indicate that he had a distinction in his mind, and we may infer that the word pompion was used for the like productions of the two localities, and that the word gourd in New England referred to the hard-rind or winter squashes, for Master Graves[121] refers to Indian pompions, Rev. Francis Higginson[121] to pompions, and Wood[122] to pompions and isquouter-squashes in New England soon after its colonization, and Josselyn[123] about the same period names also

[117] Cartier. Pink. Voy., XII., 656.
[118] Heriot. Pink. Voy., XII., 596.
[119] Acosta. Nat. and Mor. Hist. of the Indies, 1604, 264.
[120] Smith. Va. Pink. Voy., XIII., 33.
[121] Mass. Hist. Soc. Coll., 1st ser., I., 118, 124.
[122] Wood. New Eng. Prosp., 1st ed., p. II.
[123] Josselyn. Rar., 89, 120.

gourds, as quoted in our notes on the squash. Kalm,[124] about the middle of the eighteenth century, traveling in New Jersey, names "squashes of the Indians," which are a summer fruit, "gourds," meaning the winter crookneck, and "melons," which we may conclude are pumpkins; Jonathan Carver [125] in 1776 of the melon or pumpkin, called by some squashes, and says the smaller sorts are for summer use, the crane-neck for winter use, and names the large oblong, and in 1822 Woods [126] speaks of pompons, or pumpions, in Illinois, as often weighing from 40 to 60 lbs.

The common field pumpkin of America is in New England carried back traditionally to the early settlement, and occurs under several forms, which have received names which are usually quite local. Such form-varieties may be tabulated alphabetically, as below as taken from Burr:

Canada. Form oblate. 14 in. diam., 10 in. deep. Deep orange yellow.

Cheese. Flattened. 16 in. diam., 10 in. deep. Deep reddish orange.

Common Yellow. Rounded. 12 in. diam., 14 in. deep. Clear orange yellow.

Long Yellow. Oval. 10 in. diam., 20 in. deep. Bright orange yellow.

Nantucket. Various. 18 in. diam., 10 in. deep. Deep green.

The Canada Pumpkin is of an oblate form inclining to conic, and is deeply and regularly ribbed, and when well grown of comparatively large size. It is somewhat variable in size and shape, however, as usually seen. We think we are justified in the following synonymy:

Cucurbitæ indianæ and peregrinæ. Pin., 1561, 191.

Cucurbita indica, rotunda. Lugd., 1587, I., 616.

Pepo rotundus compressus melonis effigie. Lob. Obs., 1576, 365; ic., 1591, I., 642.

(?) *Pepo indicum minor rotundum.* Ger., 1597, 774.

[124] Kalm. Trav., 1770, ., 140, 347.
[125] Carver. Trav., 1776, 211.
[126] Woods. Illinois Country, 122.

Pepo silvestris. Dod., 1616, 668.

Melopepo. Tourn., 1719, t. 34.

Canada Pumpkin. Vermont Pumpkin.

Cheese Pumpkin. Fruit much flattened, deeply and rather regularly ribbed, broadly dishing about cavity and basin. Varies somewhat widely in the proportional breadth and diameter.

Melopepo compressus alter. Lob. ic., 1591, I., 643.

Pepo maximus compressus. Ger., 1597, 774.

Cucurbita genus, sive Melopepo compressus alter, Lobelio. J. B., 1651, II., 266.

Large Cheese. Fessenden, 1828; Bridgeman, 1832.

Cheese.

This variety, says Burr, was extensively disseminated in the United States at the time of the American Revolution, and was introduced into New England by returning soldiers.

Common Yellow Field. Fruit rounded, a little deeper than broad, flattened at the ends, rather regularly and more or less prominently ribbed.

Cucurbita indica. Cam. Epit., 1586, 293.

Melopepo teres. Lob. ic., 1591, I., 643.

Pepo maximus rotundus. Ger., 1597, 773.

Cucurbita aspera, Icon. I. J. B., 1651, II., 218.

Cucurbita folio aspero, zucha. Chabr., 1673, 130.

Common Yellow Field Pumpkin.

Long Yellow. Fruit oval, much elongated, the length nearly or often twice the diameter, of large size, somewhat ribbed, but the markings less distinct than those of the Common Yellow.

Cucumis Turcicus. Fuch., 1542, 698.

Melopepo. Roszlin, 1550, 116.

Pepo. Tragus, 1552, 831.

Cucurbita indica longa. Lugd., 1587, I., 617.

Pepo maximus oblongus. Ger., 1597, 773.

Pepo majer oblongus. Dod., 1616, 635; Bodæus, 1644, 782.

Cuourbita aspera, Icon. II. J. B., 1651, II., 218.

Cucurbita folio aspero, zucha. Chabr., 1673, 130.

Long Yellow Field Pumpkin.

The "*Jurumu* Lusitanus *Bobora*" of Marcgravius [127] and Piso[128] would seem to belong here, except for the leaves, but the figure is a poor one.

These forms we have just mentioned have all that something in their common appearance that at once expresses a close relationship, and to the casual observer does not express differences.

We now pass to some other forms also known as pumpkins, but to which the term squash is sometimes applied.

The Nantucket Pumpkin occurs in various forms under this name, but the form I refer to, and of which I have examined specimens, belongs to *Cucurbita pepo*, Cogn. l. c., and is of an oblong form, swollen in the middle and indistinctly ribbed. It is covered more or less completely with warty protuberances, and is of a black green color when ripe, becoming mellowed toward orange in spots by keeping. It seems closely allied to the *Courge Sucriere du Bresil* of Vilmorin. It is not the *Cuucrbita verrucosa* of Dalechamp, 1587, nor of J. Bauhin, 1651, as in these figures the leaves are represented as entire, and the fruit as melon-formed and ribbed.

In 1884 there appeared in our seedsmen's catalogues, under the name of Tennessee Sweet Potato Pumpkin, a variety very distinct, of medium size, pear-shape, little ribbed, of a creamy white striped with green color, and the stem swollen and fleshy. Of its history I have ascertained nothing, but it bears a quite strong likeness in shape to a tracing of a piece of "pumpkin" pottery exhumed from the Western mounds, and sent me by Lucien Carr, connected with the museum at Cambridge, Mass. In Lobel's history, 1576, and in his plates, 1591, appear figures of a plant which in both leaf and fruit represents fairly well our variety; and these figures are of interest as being the only ones I have yet found in the ancient botanies which represents a fruit with a swollen herbaceous stem. I think I am justified in the following synonymy:

Pepo oblongus vulgatissimus. Lob. Obs., 1576, 365.

Pepo oblogus. Lobel, ic., 1591, I., 641.

Tennessee Sweet Potato Pumpkin.

[127] Piso. Hist. Nat. Bras., 1648, 44.

[128] Piso. De Ind., 1658, 264.

A quite numerous series of pumpkins are known to our seedsmen's catalogues, and some of a form quite distinct from those here noticed, but I have not as yet sufficiently studied these so as to form an opinion. I think, however, that much may be yet learned through the examination of quite complete sets of varieties within each of the three described species of Cucurbita which furnish fruits for our consumption. Notwithstanding the ready crossings which are so apt to occur within the ascribed species, there yet seems to exist a permanency of types which is simply marvellous, and which would seem to lend countenance in the belief that there is a need of a revision of the species, and a closer study of the various groups or types which appear to have remained constant during centuries of cultivation.

If we consider the stability of types, and the record of variations that appear in cultivated plants, and the additional fact that so far as determined the originals of cultivated types have their prototype in nature,[129] and are not the products of culture, it seems reasonable to suppose that the record of the appearance of types will throw light upon the country of their origin. From this standpoint, we may hence conclude that, as the present types have all been recorded in the Old World since the fifteenth century, and were not recorded before the fourteenth and succeeding centuries, there must be a connection between the fact of the discovery of America, and the fact of the appearance of pumpkins and squashes in Europe.

The Gourd.

The word gourd is believed to be derived from the Latin *curcurbita*, but it takes on various forms in the various European languages. It is spelled *gowrde* by Turner in 1538, *gourde* by Lobel in 1576, and *gourd* by Lyte in 1586. In France it is given as *courgen* and *cohurden* by Ruellius in 1536, but appears in its present form, *courge*, in Pinaeus, 1561. Dalechamp used *coucourde* in 1587, a name which now appears as *cougourde* in

[129] See A Study of the Dandelion. AM. NAT., Jan., 1886.
See History of Celery. AM. NAT., July, 1886.
See A Study in Agr. Botany. Proc. of the Soc. for Prom. of Agr. Sc., 1886.
See History of the Currant. Trans. of West N. Y. Hort. Soc.

Vilmorin. The Belgian name appears as *cauwoord* in Lyte, 1586; and the Spanish name, *calabassa*, with slight change of spelling, has remained constant from 1561 to 1864, as has the *zucca* of the Italians and the *kurbs* of the Germans.

The *lagenaria* is but rarely cultivated in the United States, except as an ornamental plant, and as such shares a place with the small hard-shelled cucurbita which are known as fancy gourds. In some localities, however, under the name of sugar trough gourd, a lagenaria is grown for the use of the shell of the fruit for the purposes of a pail; and what is worthy of note, this type of the fruit does not exactly appear in the drawings of the botanists of the early period, nor in the seed catalogues of Europe at the present time. In the Tupi Dictionary of Father Ruiz de Montaga,[130] 1639, among the gourd names are "iacvi-gourd, like a great dish or bowl," which may mean this form. When we examine descriptions, this gourd may be perhaps recognized in Columella's account, "Sive globosi corporis, atque utero minium quae vasta tumescit,"[131] and used for storing pitch or honey; yet a reference to his prose description[132] rather contradicts the conjecture, and leads us to believe that he only describes the necked form, and this form only seems to have been known to Palladius.[133] Pliny[134] describes two kinds, the one climbing, the other trailing. Walafridus Strabo,[135] in the ninth century, seems to describe the *plebeia* of Pliny as a curcurbita, and the cameraria as a pepo; the former apparently a necked form, and the latter one in which the neck has mostly disappeared, leaving an oval fruit. Albertus Magnus,[136] in the thirteenth century, describes the cucurbita as bearing its seed "in vase magno," which implies the necked form. The following types are illustrated in the various herbalists which I have in my library:

[130] Quoted by Gray and Trumbull, *Am. Jour. of Sci.*, May, 1883, 372.
[131] Columella. Lib. X., c. 383.
[132] Columella. Lib. XI., c. 3.
[133] Palladius. Lib. IX., c. 9.
[134] Pliny. Lib. XIX., c. 24.
[135] Walfridus Strabo. Hortulus in Macer Floridus, Ed. of Silling., 1832, pp. 146, 147.
[136] Albertus Magnus. Jessen Ed., 1867, 500.

I. *Cucurbita oblonga.* Fuchs., 1542, 370.
Cucurbita plebeia. Roszlin, 1550, 115.
Cucurbita. Trag., 1552, 824.
Cucurbita longa. Cardanus, 1556, 222.
Cucurbita. Matth., 1558, 261; Pinaeus, 1561, 190; Cam. Epit., 1586, 292.
Cucurbita sive zuccha, omnium maxima anguina. Lob. Obs., 1576, 366; ic., 1591, I., 644.
Cucurbita cameraria longa. Lugd., 1587, I., 615.
Cucurbita anguina. Ger., 1597, 777.
Cucurbita oblonga. Matth., 1598, 392.
Cucurbita longior. Dod., 1616.
Zucca. Castor Durante, 1617, 488.
Cucurbita anguina longa. Bodaeus, 1644, 784.
Cucurbita longo, folio molli, flore albo. J. Bauh., 1651, II., 214; Chabr., 1673, 129.
Courge massue tres longue. Vilm., 1883, 190.
Club Gourd.
II. ———. Ruellius frontispiece, 1536.
Cucurbita minor. Fuch., 1542, 369.
Cucurbita. Trag., 1552, 824; Matth., 1558, 261; Cam. Epit., 1586, 292.
Cucurbita marina. Cardan, 1556, 222.
Cucurbita lagenaria. Lob. Obs., 1576, 366; ic., 1591, I., 644; Matth., 1598, 393.
Cucurbita cameraria. Lugd., 1587, I., 615.
Cucurbita lagenaria sylvestris. Ger., 1597, 779.
Cucurbita prior. Dod., 1616, 668.
Zucca. Cast. Dur., 1617, 488.
Courge pelerine. Vilm., 1883, 191.
Bottle Gourd.
III. *Cucurbita calebasse.* Tourn., 1719, t. 36.
Courge siphon. Vilm., 1883, 190.
Dipper Gourd.
IV. *Cucurbita major.* Fuchs., 1542, 368.
Cucurbita cameraria. Roszlin, 1550, 115.
Cucurbita. Tragus, 1552, 824; Matth., 1358, 261.

Cucurbita cameraria major. Lugd., 1587, I., 616.

Cucurbita lagenaria. Ger., 1597, 777.

Cucurbita major sessilis. Matth., 1598, 393.

Cucurbita lagenaria rotunda. Bodaeus, 1644, 784.

Cucurbita latior, folio molli, flore albo. J. Bauh., 1651, I., 215; Chabr., 1673, 129.

Sugar Trough Gourd.

V. *Cucurbita.* Matth., 1558, 261; Lugd., 1587, I., 615.

Courge plate de corse. Vilm., 1883, 191.

This classification, it is to be remarked, is not intended for exact synonymy, but to represent the like types of fruit-form. Within these classes there is a wide variation in size and proportion.

Whether these lagenaria existed in the new world before the discovery by Columbus, as great an investigator as Gray[137] considers as worthy of examination, and quotes Oviedo for the period about 1526, as noting the long and round or banded, and of all the shapes they usually have in Spain, as much used in the West Indies and Terra Firma for carrying water, and indicates that there are varieties of spontaneous growth as well as those under cultivation. The occurrence, however, of the so-called fancy gourds of the *Cucurbita pepo* species, of hard rind, of gourd shape, and often of gourd bitterness, renders difficult the identification of species through the uses. The relation of the voyage of Amerigo Vespucci,[138] 1489, mentions the Indians of Trinidad and of the coast of Paria as carrying about their necks small dried gourds filled with the plant they are accustomed to chew, or with a certain whitish flour; but these records might as well be made from the *Cucurbita pepo* gourds as from the lagenaria gourds. The further mention that each woman carried a cucurbita of water might seem to refer to gourds. Acosta[139] speaks of the Indians of Peru making floats of gourds, for swimming, and says: "There are a thousand kinds of Calebasses; some are so deformed in their bigness that of the rind cut in the

[137] Gray and Trumbull. *Am. Jour. of Sci.*, May, 1883, 370.

[138] Quoted from Gray and Trumbull, l. c.

[139] Acosta. Hist. of Indies, Eng. Ed., 1604, 177, 238.

midst and cleansed, they make as it were, baskets to put in all their meat, for their dinner ; of the lesser, they make vessels to eat and drink in," etc. Bodaeus'[140] quotation, in Latin, reads differently in a free translation : "They grow in the province of Chili to a wonderful size, and are called *capallas.* They are of an indefinite number of kinds ; some are monstrous in their immense size, and when cut open and cleaned, furnish various vessels. Of the smaller they most ingeniously make cups and saucers." In 1624 Bodaeus received from the West Indies some seed which bore fruit "quae humanum crassitudinem and longitudanem superaret," which fully justifies Acosta's idea of size. The Anonymous Portugal of Brasil[141] says : "Some pompions so big that they use them for vessels to carry water, and they hold two pecks or more." Baro[142] in 1647 also speaks of "Courges and calebasses si grandes and profondes qu'elles servent comme de magazin," and Laet[143] mentions "Pepones tam vastae, ut Indigenae iis utantur pro vasis quibus aquam aggerunt." These large-sized gourds were not, however, confined to America. Bodaeus, as we have noted, grew fruits deformed in their bigness, to use Acosta's term, from West Indian seed, and Cardanus[144] says he has seen gourds (for he gives a figure which is a gourd) weighing 80 and 122 lbs. ; Bauhin[145] records the club gourd as sometimes three feet long, Ray[146] as five or six feet long, and Forskal[147] the bottle gourd as 18 inches in diameter. These records of size are all, however, of a date following the discovery of America, and the seed of these large varieties might have come from American sources, as is recorded in one case by Bodaeus.

The gourd is of old world origin, for water-flasks of the lagenaria have been found in Egyptian tombs of the twelfth

[140] Bodaeus a Stapel. Theophrastus, 1644, 784.

[141] Anonymous Portugal of Brasil. Purchas, Lib. 7, c. I., p. 1310. Quoted from Sloane's Cat., 1696, 100.

[142] Baro in Morisot, p. 294. Quoted from Sloane's Cat., 1696, 100.

[143] Laet, Lib. 15, c. 10, p. 566. Quoted from Sloane's Cat., 1696, 100.

[144] Cardanus. De Rerum Varietate, 1556, 222.

[145] Bauhin. Pin., 1623, 313.

[146] Ray. Hist., 1686, I., 638.

[147] Forskal. Fl. Ægypt—Arab., 1775, 167.

dynasty, or 2200 to 2400 years B.C.,[148] and they are described by the ancient writers. That the gourd reached America at an early period, perhaps preceding the discovery,[149] we cannot doubt, for Marcgravius notes a cucurbit with a white flower, and of lagenarian form, in Brazil in 1648;[150] but there is not sufficient evidence, so it seems to us, to establish its appearance in America before brought by the colonists. What the calabazas were which served for water-vessels, and were apparently of considerable size, we can at present but surmise. It is possible that there are varieties of *Cucurbita pepo* not yet introduced to notice that would answer the conditions. It is also less possible that gourd-shaped clay vessels might have been used, and thus recorded by not over-careful narrators as gourds. In 1595, Mendana, on his voyage to the Solomon Islands, saw "Spanish pumpkins"[151] at the islands of Dominica and Santa Cruz, or according to another translation,[152] "pumpkins of Castille." It would seem by this reference that, whether the "calabaza" of the original Spanish referred to gourds or pumpkins, it did not take many years for this noticeable class of fruits to receive a wide distribution, and it might further imply that Mendana, setting forth from the western coast of America, discriminated between the American pumpkin, or pumpkin proper, and the Spanish pumpkin or gourd.

[148] Schweinfurth. *Nature*, Jan. 31, 1883, 314.

[149] Fruits of the lagenaria are at present carried to the coast of Iceland by ocean currents.

[150] Piso. Hist. Nat. Bras., 1648, 44.

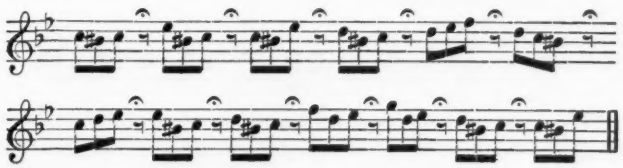
[151] Mendana. Dalyrmple, Voy., I., 72, 88.

[152] De Morga. Phillipine Is., Hak. Soc., Ed. 68, 70.

THE NOTES OF SOME OF OUR BIRDS.

BY JOHN VANCE CHENEY.

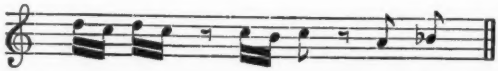
RED-EYED VIREO.

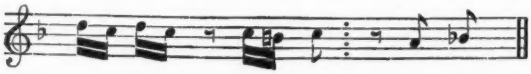
THIS lively, tireless singer, running rapidly after insects in the tops of the forest trees, singing as he goes, is heard more hours in a day and more days in the season than any other bird. There is no difficulty in distinguishing him,—the bird so easy to hear and so hard to see. The clear, high tones of his rich voice are a constant repetition of a few triplets, but so ingeniously arranged as not to become wearisome:

This illustration, containing the substance of the red-eyed vireo's song, has much in common with the music of other birds. The nest is after the fashion of the oriole's, hanging, as I have found it, beneath the fork of small beech limbs, five or six feet from the ground. It is a nice little pocket, as the cow-bird well knows.

INDIGO BIRD.

I had very little acquaintance with this bird, and knew nothing of his singing, till I sought him for study in a sunny nook near the entrance of the beautiful cemetery at Lynn. There a pair spent the season, giving me frequent opportunities to listen to the singer. His song was brief, plain, and without variation, and I supposed it to be the family song; but, to my surprise, though I have heard indigo birds sing many times since, not one of them sang that first song, the only one I have been able to copy.

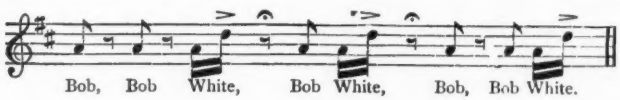
The exact tones were:

At first the tonic was not quite distinct, but, after several performances, I caught this:

The conclusion, then, was that the key was F. In the repetitions the last two tones were added about one time in six; just often enough to keep in mind the true key, which, by the constant use of sharp 4, might be lost sight of.

The form, then, was as follows:

This little visitor sang frequently and earnestly; with most fervor in the hot noon-day sun, when the birds generally were silent.

PARTRIDGE.

The partridge is said to be a general inhabitant of North America, but, familiar as I have been with almost all parts of Vermont for more than thirty years, I have only seen one quail in the state, and he was evidently a "tramp." I heard him just at night, the first day of July, 1884. Did not get sight of him till the next morning, when he came out into the sun, stood on the top rail of a fence, warmed himself, and whistled his spirited, forceful tune, his solid little body swelling and throbbing at every note, especially when he rose to the tonic.

I was prepared for him, and made an exact copy of what he gave me:

After the performance he stood, evidently listening for a reply; none came, and, without another note, he disappeared, to be seen no more.

The partridge is about one-half the size of our grouse, and resembles it in plumage and style of flight. It seems a little strange that the time of incubation should be four weeks, while the grouse and the domestic hen sit only three weeks. A nest that I found in Iowa in 1874—on the ground—seemed rather small and too deep, the sixteen eggs being piled one upon another for three layers, at least. I was told that they were all sure to hatch.

Our eastern partridge are plump, fine-looking birds, but there are two varieties in California, the "mountain" and the "valley partridge," more beautiful than ours.

EDITORIAL.

EDITORS, E. D. COPE AND J. S. KINGSLEY.

FICTION and the newspapers form the staple of the reading of the American people. Serious books which treat of matters of fact have fewer readers; and exact or scientific books fewer still. In the estimation of some people this is an unfavorable state of affairs, and speaks ill for our intellectual condition. We take a somewhat different view of it. The newspapers treat mainly of matters of fact, and they are only worthy of complaint when they give undue prominence to trivial matters, and to the evil that men do, and not enough to those events which make for human development and progress. This criticism may be justly applied to many newspapers. Also there is fiction and fiction. A class of French fiction, which has imitators in other countries, on pretence of being "realistic," is evil and only evil, and should be, in our estimation, like the "Kreutzer Sonata" of Tolstoi, excluded from the mails. But much fiction is instructive, both in the facts of human character and in those of nature, and is of great utility as conveying much truth, sugar-coated, to the unsuspecting reader. Besides, were fiction abolished the number

of readers would be greatly diminished. Fiction, in fact, is the pioneer of the intellectual life, and many persons, more's the pity, never get beyond it. Without it, they would never get so far. But many readers of fiction do better. Interest in a thousand subjects is suggested, especially history, biography, geography, metaphysics, social science, and what not. Some who begin by scoffing at science remain to pray at her shrine. And it is quite possible that society will ere long have a surfeit of fiction. Froth and sponge serve as an inflator of the mental stomach for a time, but they are apt to generate a taste for something more solid as time passes on. In fact, mankind at large will, ere long, begin to suspect that the raw material of reality out of which the frail structures of fiction are built, must be of as much interest as are its products. On a little inspection they will find that truth is really stranger than fiction, as has been often said, and that there is an inexhaustible supply of it. From being readers of Balzac and Zola, they will become subscribers to and readers of the AMERICAN NATURALIST.

RECENT BOOKS AND PAMPHLETS.

ADLERZ, G.—Our Digestionssekretionem hos Insekter och Myriopoder. Bihang. Till K. Svenska Vet. Akad. Handlingar, Band 16, 1890.

ALLEN, I. A.—On the Maximilian Types of S. A. Birds. Ext. Am. Mus. Nat Hist. N. Y., 1889.

BAUR, G.—Revision meiner Mittheilungen im *Zoologischen Anzeiger* mit Nachträgen. Separat-Abdruck aus dem *Zoologischen Anzeiger*, No. 306, 1889. Osteologische Notizen über Reptilien. Separat-Abdruck *Zoologischen Anzeiger*, No. 298, 1889.—Die Systematische Stellung von Dermochelys Blainv. Sonderabdruck aus dem Biologischen Centralblatt, Band IV., 1889. From the author.

BEAN, T. H.—Description of a new Cottoid Fish collected by the U. S. Fish Com. Ext. Proc. U. S. Nat. Mus., Vol. XII., 1890.

———. Notes on Fishes Collected at Cozumel, Yucatan, by U. S. Fish Commission, with Descriptions of New Species. Ex. from Bull. U. S. Fish Commission, Vol. VIII. From the author.

BECKER, G. F.—Silicic Acids. Ext. *Am. Jour. Sci.*, Vol. XXXVIII., 1889. From the author.

BOETTGER, O.—Die Entwicklung der Pupa-Arten des Mittelrheingebiets in Zeit und Raum. Separat-Abdruck aus den Jahrbüchen des Nassauischen Vereins für Naturkunde, Jahrgang 42, 1889.

BOGNE, E. A.—A Study of the Visible Changes that take place during the Development of Human Teeth and their Alveoli. Ext. Dental Cosmos, 1889. From J. M. White.

BRIDGE, T. W.—The Air-Bladder and Weberian Ossicles in the Siluridæ. Ext. Proc. Roy. Soc., Vol. XLVI. From the author.

BRINTON, D. G.—Aims and Traits of World-Language. Ext. *Werner's Voice Mag.* From the author.

BROWN, H. P.—The Commercial Efficiency of the Leading Systems of Electric Lighting.

Bull. No. 9, 1889, Experiment Station, Kansas Agricultural College.

Bull. No. 20, U. S. Department Agriculture. The Root-Knot Disease of the Peach, Orange, and Other Plants in Florida. From J. M. Rusk.

BUSH, G. G.—History of Education in Florida. Bureau of Education, Cir. of Inf. No. 7, 1888.

Contributions to American Educational History, Nos. 2, 4, 5, and 7.

Constitution of the Geological Society America. From J. J. Stevenson.

CRAGIN, F. W.—Contributions to the Geology of the Plains. No. 1. Extract Bull. Washburn College Lab. Nat. Hist., Vol. II., 1889.

CREDNER, H.—Die Stegocephalen und Saurier aus dem Rothliegenden des Plauenischen Grundes bei Dresden. Besonderer Abdruck aus der *Zeitschrift der deutschen geologischen Gesellschaft*, Bd. XLI., 1889. From the author.

DAWSON, I. W.—New Species of Fossil Sponges from the Siluro-Cambrian at Little Metis. Trans. Roy. Soc. Can., Vol. VII., 1889.

———. Notes on the Cretaceous of the British Columbian Region—The Nanaimo Group. Extract *Am. Jour. Sci.*, Vol. XXXIX., 1890.

———. On the Earlier Cretaceous Rocks of the Northwestern Portion of the Dominion of Canada. Extract *Am. Jour. Sci.*, Vol. XXXVIII., 1889.—Glaciation of British Columbia. Extract *Geol. Mag.*, 1889.

DAWSON, W., AND D. P. PENHALLOW.—On the Pleistocene Flora of Canada. Bull. Geol. Soc. Am., Vol. I., pp. 311–334.

Declaration of Principles of the Sceiety of Individualists, 1890.

DOEDERLEIN, L.—Bericht über die Zoologische Abtheilung des Museums für Jahre 1886 bis 1889. Naturhistorisches Museum der Stadt Strassburg.

ECCLES, R. G.—Evolution of the Mind. *Modern Science Essayist*, Vol. I., 1889 From the author.

EIGENMANN, C. H., and R. S. EIGENMANN.—Additions to the Fauna of San Diego. Ext. Proc. Cal. Acad. Sciences, Vol. III.

———. Description of a New Species of Cyprinodon.—A Review of the Erythrininæ. Ext. Cal. Acad. Sci., 1880.

———. A Revision of the Edutulous Genera of Curimatinæ. Ext. Ann. N. Y. Acad. Sci., Vol. IV.

———. Notes on some California Fishes, with Descriptions of two New Species. Ext. Proc. U. S. Nat. Mus., 1888.

———. Notes from the San Diego Biological Laboratory. The Fishes of Cortez Banks.

———. Preliminary Notes on South American Nematognathi. Ext. Proc. Cal. Acad. Sci., 2d Ser., II. From the authors.

Evolution.—Popular Lectures and Discussions before the Brooklyn Ethical Association, 1889. From James H. West, publisher.

FEWKES, J. W.—Statement of Plans for the Establishment of a Fresh-Water Aquarium and Zoological Garden at Boston, 1889.

FÜRBRINGER, M.—Über die Stellung von Stringops, der Papageien, und von *Jynx*.

HAYNES, H. W.—The Prehistoric Archæology of North Am. Chap. VI., Vol. I., of Narrative and Critical Hist. of Am., edited by Justin Winsor. From the author.

HADDEN, A. C.—A Revision of the British Actiniæ, Part I. Trans. Roy. Dub. Soc., Vol. IV., 1889.

HEAD, F H.—Shakespeare's Insomnia. From the author.

HECTOR, J.—On the Fossil Reptilia of New Zealand. Ext. Proc. Wellington Philos. Soc., 1873. From the author.

HILL, R. T.—Relation of the Uppermost Cretaceous Beds of the Eastern and Southern U. S. Ext. *Am. Jour. Sci.*, Vol. XXXVIII., 1889.

HORN, G. H.—Reply to C. V. Riley on Platypsyllus.

HOWES, G. B.—Additional Observations upon the Intranarial Epiglottis. Ext. *Jour. Anat. and Physiol*, Vol. XXIII. From the author.

JONES, C. E.—Education in Georgia. Circulation of Information, No. 4, Bureau of Education.

KALOUSEK, J.—Die Königlich Böhmische Gesellschaft der Wissenschäften in Prag. Jahresbericht der Königl. Böhm. Geschellschaft der Wissenschaften für das Jahr., 1889.

KEISER, E. H.—On the Combustion of Weighed Quantities of Hydrogen, and the Atomic Weight of Oxygen. Ext. *Am. Chem. Jour.*, Vol. X. From the author.

LAWRENCE, G. N.—A New Name for the Species of Sporophila from Texas. Ext. *Auk*, Vol. VI.—Description of a New Species of Wren from Tobago, W. Ind. Ext. *Auk*, Vol. V.—Description of a New Species of Bird of the Genus Catharus, from Ecuador. Proc. U. S. Nat. Mus., 1887.

LANGLEY, S. P.—Report of the Smithsonian Institution for the year ending June 30, 1889.

LEBOUCQ, H.—De la Soudure Congénital de Certains os du Tarse. Ext. Bull. d l'Acad. Royal de Médecine de Bruxelles, 1890.

Über Nagelrudimente au der Fötalen Flosse der Cetacean und Sirenier. Sonder-Abdruck aus *Anatomischer Anzeiger*, IV., Jahrgang, 1889. From the author.

LECHE, W.—Dr. H. G. Bronn's Klassen und Ordnungen des Thier-Reichs Wissenschaftlich Dargestellt in Wort und Bild. Sechster Band. V. Abtheilung.

LIDTH DE JEUDE, TH. W. VON.—On a Collection of Snakes from Delhi. Ext. Notes Leyden Mus., Vol. XII. From the author.

List Publications Johns Hopkins University.

Macalester College Contributions, No. 6. Notice of a Rare Washington Portrait; also Descriptions of Some Copper Relics of the T. H. Lewis Collection.

MALLERY, G.—Israelite and Indian. Ext. *Pop. Sci. Monthly*, 1889. From the author.

MERRIAM, G. H.—Revision of the North American Pocket Mice.—Descriptions of Fourteen New Species and One New Genus of A. Amer. Mammals. North Am. Fauna, No. 1. From U. S. Dept. Agri.

MILLER, S. A.—North American Geology and Palæontology. From the author.

MOURLON, M.—Sur le Gisement des Silex Taillés Attribuér à l'Homme Tertiare, aux Environs de Mons. Ext. Bull. de l'Acad. Roy. de Belgique, Tome XVII., 1889. From the author.

MONTGOMERY, E.—Mental Activity. Ext. *Mind*, Vol. XIV.

MORGAN, A.—The Society and the "Fad." Fact and Theory Papers No. 11. From the author.

MYSTRÖM, E.—Orn en Monstros Form af *Cottus scorpius* Lin. Bihang Till K. Svenska Vet. Akad. Handlingar, Band 14, 1889.

NEWBERRY, J. S.—Sketch of Pres. F. A. P. Barnard, LL.D., S.T.D., L.H.D. Reprint from Necrology Report of the University Convocation of the State of New York July 9–11, 1889.

———. The Oil-Field of Colorado. Ext. *School of Mines Quarterly*, Vol. X., No. 2, Jan., 1889.

———. The Laramie Group.—The Rock Salt Deposits of the Salina Group in Western N. Y. Exts. Trans. N. Y. Acad. Sci., Vol. IX.

———. Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley. Monograph U. S. Geol. Survey, Vol. XIV.

———. The Paleozoic Fishes of North America. Monograph U. S. Geol. Survey, Vol. XVI. From the author.

PALMER, C. T.—Artificial Persons: A Philosophical View of the Law of Corporations. Extract *Open Court*, 1888. From Dr. P. Carus.

POHLIG, H.—Dentition and Kranologie des *Elephas antiquus* mit Beiträgen über *Elephas primigenius* Blum. und *Elephas meridionalis* Nesti. Nova Acta der Ksl. Sedf. Carol. Akad. der Naturforscher, Band LIII.

Prevention of Swine Plague by Inoculation. From F. S. Billings & Co.

Report Arkansas Geol. Survey, 1888.

Report Brooklyn Ethical Association, 1888–'89.

Report of the Curator Harvard Mus. Comp. Zool., 1888–'89.

Report of the California State Mineralogist for the year ending Oct. 1, 1888.

Report of the Germantown Science and Art Club at the Tenth Anniversary, 1890.

Reports of Sub-Committees of the International Congress on Classification and Nomenclature.

Report of the Trustees of the Australian Museum for 1889.

RENEVIER, E.—Philippe de la Harpe, Sa Vie, et ses Travaux Scientifiques. Tiré du Bull. Soc. Vaud. Sc. Nat., Vol. XXV. From the author.

ROTH, S.—Catalogue No. 5. Fossiles de la Pampa Amérique du Sud.-Avis.

SHUFELDT, R. W.—Remarks upon Extinct Mammals.

———, Observations upon the Osteology of the Orders Tubinares and Steganopodes. Ext. Proc. U. S. Nat. Mus, Vol. XI., 1889.—Osteological Studies of the Sub-Family Ardeinæ. Ext. *Journal Comp. Med. and Surg.*, 1889.

———. Observations upon the Osteology of the Larus and Grebes. Ext. *Journal Anat. and Phy.*, Vol. XXIV.

———. On the Position of Chamæa in the System. Reprint *Journal Morph.*, Vol. III., No. 3. From the author.

Sketch of the Laboratory of Biological Research of the Brooklyn Institute.

SMITH, C. L.—History of Education in North Carolina. Bureau of Ed., Cir. of Inf. No. 2, 1888.

STEFANESCU, G.—Mémoire Relatif à la Geologie du Judet del Doljin. Annarulŭ Biurouliu Geologicŭ, 1882–'83, No. 4.

TAVEL, F. VON—Contributions to the History of the Development of Pyrenomycetes. Ext. *Journal Mycology*, 1889. From J. M. Rusk.

RECENT LITERATURE.

Eimer on Evolution.[1]—This work reaches the scientific men of English-speaking countries at a time when the views of Weismann are being read, and it serves as a source of evidence on the opposite side of the interesting question which they discuss. Professor Eimer has taken a broader view of the field than is done by that large class of biologists whose knowledge is limited by the use of the microscope, and he is therefore in possession of a class of facts which are apt to

[1] Organic Evolution as the Result of the Inheritance of Acquired Characters, According to the Law of Organic Growth, by G. H. Theodor Eimer, Professor of Zoology and Comparative Anatomy at the University of Tübingen. Translated by I. H. Cunningham, M.A., F.R.S.E. London: MacMillan & Co., and New York, 1890. 8vo, pp. 435.

escape the researches of the histologists and embryologists. While using the many important and essential facts brought to light by the latter class of investigators, he has not neglected researches which do not require the mechanical appliances which give a somewhat factitious value to the pursuits of microscopy and telescopy. Prof. Eimer is already well known through his important investigations on the distribution and origin of color-markings in insects and reptiles; his discussion of the variations of the wall lizard of Europe (*Lacerta muralis*) being a model of this kind of work. From these and similar researches on the variations in the colors of caterpillars, and imagines of various Lepidoptera, he has shown conclusively that *color-variations are not promiscuous or fortuitous, but follow certain definite directions.* This result is in entire harmony with those derived from similar studies which I have made on the coloration of certain snakes, and of which I have published, especially the case of the North American *Ophibolus doliatus.*[2] The author then proceeds to discuss the effects of physical agencies as causes of variations, as light, temperature, humidity, etc. Of the effects of use and disuse he says (p. 153): "It is a self-evident physiological fact that practice or use strengthens and improves the organs of the body, while disuse causes them to deteriorate." He then adds: "That characters acquired through use or disuse are inherited, and must therefore aid in the formation of new species, can be proved more easily than any of the propositions I am maintaining. If I were to bring together all the facts which could be used as evidence on this point, I should never come to the end of them, for I should have to refer to all the facts of anatomy and physiology. But I intend to show in particular that use and disuse by themselves must lead to the formation of new permanent characters, without the aid of selection, for even this I hold to be a physiological necessity." Accordingly, the author cites many facts in support of this view. Among these he relates some interesting cases of the inheritance of mutilations and abnormalities.

Considerable space is devoted to the question of the origin and transmission of mental characteristics, and here especially Prof. Eimer shows himself an acute observer and thinker. His residence has grounds attached to it, where he has been accustomed to have under his eye animals both domestic and wild, and his observations on the habits of these are highly interesting. He coincides in opinion with most observers on this subject, that mental habits are readily transmitted by inheritance, and his observations on young chickens and other birds are very instructive.

[2] Proceeds, U. S. National Museum, 1888, p. 381. Bulletin do., I. 1875, p. 3.

Prof. Eimer takes occasion frequently to criticise the opinions of Prof. Weismann. The following is a sample of this polemic :.

"In the paper previously mentioned, 'Retrogression in Nature,' Weismann replies with greater detail and precision than on previous occasions to the objections which may be made—as they have been made by me—to his theory on account of the facts of the degeneration of organs in consequence of disuse.

"Starting from the proposition that 'the adaptation of living beings, in all their parts, depends on the process of natural selection,' he infers that this adaptation must be maintained by the same means by which it was produced, and that it must again disappear as soon as this means, natural selection, fails to act.

"In other words, he says: Through natural selection alone forms have come to be what they are. By the continuation of natural selection only are they maintained in their present state. If selection ceases, they of necessity retrograde. But selection with respect to a particular organ obviously ceases as soon as that organ is no longer necessary ('the reverse side of natural selection'); its cessation, therefore, produces the degeneration of organs.

"It is, according to my view, self-evident that the cessation of natural selection can as little cause the retrogression of an organ as natural selection can cause it to develop. Selection is, I must ever repeat, no physiological factor which could produce any thing new, or whose cessation could annul anything existing. Organs are produced by external stimuli, or by use acting upon the material given in a given case, with the aid of general and of sexual selection."

In this position the author is in entire harmony with the views of the Neo-Lamarkian school in America and England; and he supports it with an array of facts which fill a great part of the 435 pages which comprise the volume. We regret that he has not been apparently acquainted with the opinions entertained by his co-workers on this side of the Atlantic, as he might have derived some facts of use to him. To paleontology, that mine of evidence for the evolutionist, he makes but little reference; and, in fact, this subject has not been within the scope of his researches, which have been so abundant in other directions.

With respect to the cause of variations, he adduces the following example:

"Oscar Schmidt points out further that numerous [other] cases in sponges have been described by Haeckel and himself, in which the organisms are beginning to change into new species by the disappear-

ance of certain forms of skeletal structures. And I am able to add that in the markings of animals—*e.g.*, butterflies—characters everywhere degenerate whose present or former use cannot be discerned, which we must regard as non-essential.

"Weismann supposes that even in those cases in which adaptation is not demonstrated it is really present. But such an assumption belongs to the domain of faith.

"We ought, on the contrary, to say: We know that definite stimuli must produce an effect on or in the organism; that they must give rise to definite changes of form, definite character, whether these be useful to the organism or not.

"When we maintain this we take our stand, not on mere assumptions, but on physiological facts. Normal physiology and pathology in like measure speak for us with the weight of all their fundamental truths.

"Thus there is certainly a physiological basis for the belief that the above-described variations of the sponge-skeleton are simply to be ascribed to changes of external, *i.e.*, of nutritive conditions, of the material composition of the body."

The translator has performed an excellent service. We cannot but agree with him in some remarks in his preface as to the editorial conduct of the English periodical *Nature*. He complains of the exclusion of articles which do not coincide with the views of the editor of the department of Natural History. On this we observe that such exclusions, no doubt, often occur, but though it may not be commended as judicial, it is within editorial right. But mutilation or alteration of articles, as is sometimes practiced by that periodical, is clearly not within editorial right, and to this practice exception may be still more fairly taken.—*E. D. Cope.*

Geddes and Thompson on the Evolution of Sex.[1]—In this book we have a systematic *résumé* of what is known on the subject of sex, with inferences which appear to the authors reasonably to flow from the facts. The work is divided into four "books," viz.: I. Male and Female; II. Analysis of Sex,—organs, tissues, cells; III. Processes of Reproduction; IV. Theory of Reproduction. The work done in this direction has been very large in the last few years, and the time was ripe for the presentation to the public of just such a work as the present. The subject is not only intrinsically interesting, but it has the closest relation to the general question of

[1] The Evolution of Sex. By Prof. Patrick Geddes and J. Arthur Thompson. 8vo, pp. 322. From the Contemporary Science Series. London: Walter Scott.

evolution. Further, the essential nature of sex-character has the greatest practical bearing on human affairs, and its thorough comprehension cannot fail to be of great utility to society. In fact, such knowledge is the one thing needful to regulate the unbridled fancies of the uneducated mind which attempts to deal with the subject, and which has produced innumerable absurdities since the human imagination began to be active.

The authors have produced a book which has not only scientific but literary merits, and many of its bright passages indicate the artist as well as the thinker. The more delicate parts of the subject are handled with a tact that cannot give offence to persons of most opposite views, ; and a judicious reserve is maintained in the presence of unsolved social problems, with the discussion of which the volume closes.

The fundamental character of sex-diversity is demonstrated, and is traced in the characteristic peculiarities of the germ-cells of the sexes, as at present existing. The superior activity of the male cell (spermatozoöid), with its expenditure of energy in segmentation so long as material for its nutrition is accessible, is taken as reflected into the male character generally. The large, inactive female cell (ovum), abounding in nutritive material, which is ready for active functioning on the accession of male energy, is thought to be reflected more or less in the general habit of the female. The facts in evidence which sustain this position are as numerous as are the phenomena of life, and a large number of them are recorded in the present work. The views of the authors are more expressly stated in the following extracts:

"Without multiplying instances, a review of the animal kingdom, or a perusal of Darwin's pages, will amply confirm the conclusion that on an average the females incline to passivity, the males to activity. In higher animals it is true that the contrast shows rather in many little ways than in any one striking difference of of habit, but even in the human species the contrast is recognized. Every one will admit that strenuous, spasmodic bursts of activity characterizes men, especially in youth, and among the less civilized races; while patient continuance, with less violent expenditure of energy, is as generally associated with the work of women.

"For completeness of argument two other facts, which will afterwards claim full discussion, may here be simply mentioned: (*a*). At the very threshold of sex-differences we find that a little active cell or spore, unable to develop of itself, unites in fatigue with a larger, more quiescent individual. Here, at the very first, is the contrast between

male and female. (*b*). The same anthithesis is seen when we contrast, as we shall afterwards do in detail, the actively motile, minute male element of most animals and many plants with the larger, passively quiescent female cell or ovum.

"While it is easy to point to the general physiological import of large size and the reverse, physiology is not yet far enough advanced to afford firm foot-hold in dealing with the details of secondary sexual characters. It is only possible to point out the path which will eventually lead us to their complete rationale. This path will appear less vague if reverted to after some of the succeeding chapters have been grasped. The point of view is simple enough. The agility of males is not a special adaptation to enable that sex to exercise its functions with relation to the other, but is a natural characteristic of the constitutional activity of maleness; and the small size of many male fishes is not an advantage at all, but simply again the result of the contrast between the more vegetative growth of the female, and the costly activity of the male. So, brilliancy of color, exuberance of hair and feathers, activity of scent-glands, and even the development of weapons, are not, and cannot be (except teleologically), explained by natural selection, but in origin and continued development are outcrops of a male as opposed to a female constitution. To sum up the position in a paradox, all secondary sexual characters are at bottom primary, and are expressions of the same general habit of body (or to use a medical term, *diathesis*), as that which results in the production of male elements in the one case, or female elements in the other.

"Three well-known facts must be recalled to the reader's mind at this point; and firstly, that in a great number of cases the secondary sexual characters make their appearance step by step with sexual maturity itself. When the animal, be it bird or insect, becomes emphatically masculine, then it is that these minor out-crops are exhibited. Thus the male bird of paradise, eventually so resplendent, is usually in its youth comparatively dull and female-like in its coloring and plumage. Very often, too, whether in the wedding-robes of male fishes or in the scent-glands of mammals, the character rises and wanes in the same rhythm as that of the reproductive periods. It is impossible not to regard at least many of the secondary sexual characters as part and parcel of the sexual diathesis,—as expressions, for the most part of exuberant maleness. Secondly, when the reproductive organs are removed by castration, the secondary characters tend to remain undeveloped. Thus, as Darwin notes, stags never renew their antlers after castration, though normally of course they renew them each

breeding season. The reindeer, where the horns occur on the female as well, is an interesting exception to the rule, for after castration the male still renews the growth. This, however, merely indicates that the originally sexual characters have become organized into the general life of the body. In sheep, antelopes, oxen, etc., castration modifies or reduces the horns; and the same is true of odoriferous glands. The parasitic Crustacean Sacculina has been shown by Delage to effect a partial castration of the crabs to which it fixes itself, and the same has been observed by Giard in other cases. In two such cases an approximation to the female form of appendage has been observed. Lastly, in aged females, which have ceased to be functional in reproduction, the minor peculiarities of their sex often disappear, and they become liker males, both in structure and habits,—witness the familiar case of 'crowing hens.'

"From the presupposition, then, of the intimate connection between the sexuality and the secondary characters (which is indeed everywhere allowed), it is possible to advance a step further. Thus in regard to color, that the male is usually brighter than the female is an acknowledged fact. But pigments of many kinds are physiologically regarded as of the nature of waste products. Such, for instance, is the guanin, so abundant on the skin of fishes and some other animals. Abundance of such pigments, and richness of variety in related series, point to preëminent activity of chemical processes in the animals that possess them. Technically expressed, abundant pigments are expressions of intense metabolism. But predominant activity has been already seen to be characteristic of the male sex; these bright colors, then, are often natural to maleness. In a literal sense animals put on beauty for ashes, and the males more so because they are males, and not primarily for any other reason whatever.

"We are well aware that, in spite of the researches of Krukenberg, Sorby, MacMunn, and others, our knowledge of the pigments is still very scanty. Yet in many cases, alike among plants and animals, pigments are expressions of disruptive processes, and are of the nature of waste products, and this general fact is at present sufficient for our contention, that bright coloring or rich pigmenting is commonly a natural expression of the male constitution. For the red pigment so abundant in the female cochineal insect, which appears to be of the nature of a reserve and not a waste product, and for similar occurrences, due exception must be made.

"In the same way, the skin-eruptions of male fishes at the spawning eason seem more pathological than decorative, and may be directly

connected with sexual excitement. One instance of a way in which the reproductive maturity is known to effect a by no means obviously related result may be given. Every field-naturalist knows that the male stickleback builds a nest among the weeds, and that he weaves the material together by mucous threads secreted by the kidneys. The little animal is also known to have strong passions; it is polygamous in relation to its mates, and most pugnacious in relation to its rivals. Professor Möbius has shown that the male reproductive organs (or testes) become very large at the breeding season, and that they press in an abnormal way upon the kidneys. This encroachment produces a pathological condition in the kidneys, and the result is the formation of a mucous secretion, somewhat similar to what occurs in renal disease in higher forms. To free itself from the irritant pressure of this secretion the male rubs itself against external objects, most conveniently upon its nest. Thus the curious weaving instinct does not demand nor find rationale in the cumulative action of natural selection upon an inexplicable variation, but is traced back to a pathological and mechanical origin in the emphatic maleness of the organism. The line of variation being thus given, it is of course conceivable that natural selection may have accelerated it.

"So, too, though again the physiological details are scanty, the superabundant growth of hair and feathers may be interpreted, in some measure, through getting rid of waste products, for we shall see later how local katabolism favors cell multiplication. Combs, wattles, and skin excresences point to a predominance of circulation in the skin of the feverish males, whose temperatures are known in some cases to be decidedly higher than those of females. Even skeletal weapons like antlers may be similarly interpreted; while the exaggerated activity of the scent-glands is another expedient for excreting waste.

"In regard to horns, feathers, and the like, in association with vigorous circulation, two sentences from Rolph may be quoted: 'The exceedingly abundant circulation which periodically occurs in the at first soft frontal protuberances of stags admits and conditions the colossal development of horn and ensheathing velvet. . . . In the same way the rich flow of blood in the feather papillæ conditions the immense growth of the feathers, . . . and the same is true of hairs, spines, and teeth.'

"Some of the even subtler differences between the sexes are of interest in illustrating the general antithesis. Thus in the love-lights of the Italian glow insect (Luciola) the color is said to be identical in the

two sexes, and the intensity is much the same. That of the female, however, who is in other respects rather male-like in her amatory emotions, is more restricted. It is interesting further to notice that the rhythm of the light in the male is more rapid, and the flashes are briefer, while that of the female is longer, and the flashes more distant and tremulous. This illustration may thus serve, in conclusion, as a literally illumined index of the contrasted physiology of the sexes.

"We are now in a better position to criticize Mr. Darwin's theory. On his view, males are stronger, handsomer, or more emotional, because ancestral forms happened to become so in a slight degree. In other words, the reward of breeding success gradually perpetuated and perfected a casual advantage. According to the present view, males are stronger, handsomer, or more emotional, simply because they are males,—*i. e.*, of more active physiological habit than their mates. In phraseology which will presently become more intelligible and concrete, the males live at a loss, are more *katabolic*,—disruptive changes tending to predominate in the sum of changes in their living matter or protoplasm. The females, on the other hand, live at a profit, are more *anabolic*,—constructive processes predominating in their life, whence, indeed, the capacity of bearing offspring."

Thus it is evident that the authors of the present work hold the tenets of the Neo-Lamarkians in maintaining the direct influence of physical causes as producing variation, and in the belief that acquired characters are inherited. The reasons for the adoption of these views are often stated, and with a good deal of force. The reasons why promiscuous variation and natural selection are inadequate to explain evolution, are also clearly set forth.

In the last chapter the question of population raised by Malthus is considered. Writing in a country which is, so long as the unequal distribution of land continues, fully populated, the authors admit the necessity for some method of restraining the increase of families. They consider the propositions of the Neo-Malthusians for limiting the increase by various artificial measures, and decide in favor of a different course. They observe: "It seems to us, however, essential to recognize that the ideal to be sought after is not merely a controlled rate of increase, but regulated married lives. Neo-Malthusianism might secure the former by its more or less mechanical methods, and there is no doubt that a limitation of the family would often increase the happiness of the home; but there is danger lest, in removing its result, sexual intemperance become increasingly organic. We would urge, in fact, the necessity of an ethical rather than a mechanical

'prudence after marriage;' of a temperance recognized to be as binding on husband and wife as chastity on the unmarried. . . . We need a new ethic of the sexes; and this not merely or even mainly as an intellectual construction, but as a discipline of life; and we need more. We need an increasing education and civism of women,—in fact, an economic of the sexes very different from that nowadays so common, which, while attacking the old coöperation of men and women because of its manifest imperfections, but offers us an unlimited and far more mutually destructive industrial competition between them instead. . . . And while our biological studies of course for the most part only point the way towards deeper social ones, they afford also one luminous principle toward their prosecution,—that thorough parallelism and coincidence of psychical and material considerations, upon which moralist and economist have been too much wont to specialize."

The authors do not state clearly what their "new ethic" is to be, excepting that it is to be based on a thorough recognition of the basis of biologic fact which underlies the problem. They are evidently not in sympathy with the entrance of women into either industrial or political competition with men, nor do they see in the present position of woman anything more than the natural outcome of natural evolution. "Instead of men and women merely laboring to produce things, as the past economic theories insisted, or competing over the distribution of them, as we at present think so important, a further swing of economic theory will lead us round upon a higher spiral to the direct organic facts. So it is not for the sake of production or distribution, of self-interest or mechanism, or any other idol of the economists that the male organism organizes the climax of his life's struggle and labor, but for his mate; as she, and therefore he, also, for their little ones. Production is for consumption; the species is its own highest, its sole essential product. The social order will clear itself as it comes more in touch with biology."

General Notes.

GEOGRAPHY AND TRAVELS.

Mexico.—In a communication made to the Academy of Natural Sciences of Philadelphia, at a recent meeting, Professor Heilprin placed on record his barometric determinations of the heights of the four loftiest summits of the Mexican Republic,—Orizaba, Popocatepetl, Ixtaccihuatl, and the Nevado de Toluca. From these it would appear that considerable corrections will have to be made in geographies of the recorded heights of these far-famed giants of the South. All the observations were made by means of a carefully tested aneroid barometer, and the data computed from almost simultaneous observations made at the Mexican Central Observatory of the City of Mexico, and from barometric readings made at the sea level at Vera Cruz. The The equable condition of the atmosphere at the time these observations were made rendered the possibility of the occurrence of possible errors of magnitude almost *nil*.

HEIGHT OF POPOCATEPETL.—The height of Popocatepetl, commonly accepted as the highest peak, was recorded by Alexander von Humboldt in 1804 as 17,720 feet. Several measurements have been made since the date of the grigonometrical observations of the distinguished German traveler, and with results varying from 17,200 feet to somewhat over 18,000 feet. Professor Heilprin's measurements give 17,523 feet, or 200 feet less than the estimate of Humboldt, as corrected by his astronomical associate, Oltmanns. The significant fact, however, pointed out, that while geographers have almost universally accepted Humboldt's determinations and figures, they have neglected to take account of the newer data which have been made possible through the leveling of the Mexican Railway, which was constructed a few years since. These show that the estimate of the elevation of the City of Mexico (7,470 feet) and of the adjoining plateaus, which have served as a basis for most of the angle measurements of the mountains, have been placed 123 feet too high. Allowing for this excess, a striking correspondence is established between the early measurements and those obtained in the spring of the year by the Philadelphia expedition.

The ascent of the peak was made on the 16th and 17th of April by Professor Heilprin and Mr. F. C. Baker, the rim of the crater being reached at 11.30 o'clock on the morning of the 17th, and the culminating point early in the afternoon of the same day. Little difficulty was encountered in the ascent beyond that which is due to the inconvenience arising from the highly rarified atmosphere. The snow field was found to be of limited extent, and not more than from five to ten feet in depth, and was virtually absent from the apex of the mountain. The surprisingly mild temperature of the summit, 45 degrees Fahrenheit, rendered a stay of several hours in cloudland very delightful.

THE MOUNTAIN OF ORIZABA.—With regard to the elevation of what is commonly supposed to be the second highest summit of the Mexican Republic, the peak of Citlaltepetl or Orizaba, the results of Professor Heilprin's determinations show more marked variations from those of most of the earlier investigators, and more particularly from those of Humboldt. The latter determined the height of the mountain, by means of angles taken from near the town of Jalapa, to be 17,375 feet, while a still earlier determination by Ferrer, in 1796, and recorded in the transactions of the American Philosophical Society, gave 17,879 feet. The latter estimate has been generally adopted by German geographers, and Humboldt himself has considered it more nearly representing the truth than his own measurement. The Mexican geographers, on the other hand, have adopted the measurement of Humboldt, or that which was obtained by the National Commissions of 1877, and which indicated a height of 17,664 feet.

Professor Heilprin, with three of his scientific associates and eleven guides, made the ascent of the mountain on the 6th and 7th of April, or ten days before the ascent of Popocatepetl. The last camp, at a height of some 13,000 feet, was left shortly before five o'clock in the morning of the second day, and after a difficult and continuous struggle of twelve hours through loose boulders, sand, and a much cut-up ice cap, the party—or rather the fragment which succeeded in holding out—finally reached the rim of the crater.

A photograph was here obtained of the depression which marks the summit of this most symmetrical cone of the North American continent. Professor Heilprin's measurement, which was made at a point about 120 feet below the apex of the cone, indicates a total height of the mountain of 18,206 feet, or some 325 feet in excess of the measurement of Ferrer, and upwards of 800 more than that of Humboldt.

The equal conditions of the atmosphere under which the measurements of both the peaks of Orizaba and Popocatepetl were made, and

the fact that the two measurements were made with the same instruments, after an interval of only ten days, appear to leave but little room for doubt that the latter determination is within close limits the correct one. There thus seems no question but that the first place among Mexican volcanoes must be accorded to the "Star Mountain."

The sense of excessive fatigue which marked the ascent of this mountain as compared with that of Popocatepetl was considered in itself a sufficient index of the much greater elevation. Messrs. Witmer Stone and F. C. Baker, two of Professor Heilprin's associates, were compelled to desist from the final attack upon the mountain when not more than some 300 feet below the summit. Mr. Le Boutillier's strength failed him at an elevation of about 14,000 feet.

As upon Popocatepetl, the snow cap upon Orizaba, although arising 2,400 feet, or nearly half a mile, above the summit of the highest peak of the Alps, was a comparatively insignificant development. Only a quarter of an hour was passed on the crest of the mountain when the difficult descent through the numerous *seracs* of the ice was made. The camp was reached at a little after eight o'clock in the evening, thus completing a remarkable round of mountain-climbing of fifteen successive hours.

The views from the slopes of the mountain are described as being surpassingly grand, far exceeding anything that Professor Heilprin had hitherto seen in his travels. Far off to the west the giants Popocatepetl and Ixtaccihuatl were clearly outlined against the sky at a distance of about 100 miles, while to the east and south the eye wandered over a seemingly endless expanse of plateaus and lowlands, penetrating through a series of successive cloud-planes.

Ascent of Ixtaccihuatl.—The ascent of the third highest peak of the Republic, Ixtaccihuatl, was made on the 27th of the same month on which the two other ascents above noted were also made. In its general features, this mountain differs broadly from the two peaks before mentioned. Although the remains of a volcano, it no longer presents either the symmetry or conical outline of its more famous rivals. A strong, flowing crest, covered with a heavy deposit, some 75 or 100 feet in thickness, of snow and ice, serves readily to distinguish the familiar "White Woman" of the plain of Auahuac.

Above what is now the highest point there at one time arose the crater wall, but the destruction through natural causes of the summit has completely obliterated all traces of both the crater and wall. The heavy cap of snow, a true *firn*, or *nèvè*, feeds one or more glaciers which descend the western slopes. Across one of these glacial ice

sheets, whose nature was now for the first time made known to the Mexicans, the dangerous ascent was accomplished. Huge crevasses at short intervals barred the progress of the march, but the point, estimated to be about 75 yards below the summit, was reached about 10.30 o'clock in the morning. Two impassable crevasses, cutting the crest of the mountain at right angles, prevented a nearer approach to the apex.

Professor Heilprin's measurements determined the height of this mountain to be 16,962 feet, or from 800 to 1,300 feet above that which is accorded to it by Mexican geographers. This determination, on the other hand, accords very closely (within 11 feet) with the very careful, but now generally overlooked, trigonometrical measurements made in 1857 by Sonntag, under the auspices of Baron von Müller.

It is difficult to account for the low value of the height of this mountain given by Humboldt and the Mexican geographers, in view of its close proximity to Popocatepetl. So nearly do they appear of equal height that the eye at first fails to distinguish which of the two summits is the highest. German geographers, however, in a few cases, have adopted Sonntag's measurements, neglecting, however, as in the cases of Popocatepetl, to make allowances for the error, in this case of 125 feet, which is indicated by the leveling of the Mexican Railway.

The temperature on the summit of Ixtaccihuatl was found to be much lower than on either of the other peaks, being 32 degrees Fahrenheit.

Ascent of Nevada de Toluca.—The fourth highest summit of the Republic, the Nevado de Toluca, was ascended by Professor Heilprin and Mr. Baker on the 25th of April. This mountain, owing to its lesser elevation, has a much easier ascent than the others. In fact, it can be ascended by horseback to within about 600 feet of the apex. The rim of the broken crater is extremely ragged and narrow, descending with almost equal abruptness to the inner and outer faces of the volcano. At some points the crest is so attenuated that it can be readily straddled. This feature recalls the famous *Polnischer Kamm* of the Carpathian Mountains, which Professor Heilprin ascended in 1878, and from which there is obtained a precipitous descent on the one side into Gallicia, and on the other into Hungary.

The barometric determination of the Nevada de Toluca gave a height of 14,952 feet, and gave approximately the mean between the determination of Humboldt and those of a class of students from the School of Engineers of the city of Toluca.

In regard to the position which the peak of Orizaba holds to the mountains of the North American continent generally, it may be said that its only rival without the Mexican domain is Mount St. Elias, situated on approximately the 141st parallel of latitude, and whose summit is claimed both by Great Britain and the United States (Alaska) as their possession.

So broadly divergent, however, are the results of the measurements of this mountain that as yet it has been impossible to obtain even remote concurrence in the views of geographers. Thus the early measurements of La-Pèrouse, made in 1786, give less than 13,000 feet. The British Hydrographic Chart of 1872, with its data borrowed from still earlier charts, gives 14,970 feet, and this estimate is the one which is generally followed by the English and a number of American geographers. Malespina in 1791 determined the height by means of angles, taken from near the position of Fort Mulgrave, to be 17,851 feet, which figure is reduced by Tebenkoff by somewhat more than 900 feet.

The most recent carefully conducted series of measurements are those which were made by Mr. W. H. Dall, under the auspices of the United States Coast Survey, in 1874. These yielded results ranging from a little more than 18,000 to nearly 20,000 feet. The measurements were made from distances of 69, 127, 167 miles, and it is more than likely that the discrepancy in the results obtained is due to the very small angles of measurements, and to an uncertainty regarding the actual position of the mountain.

The extreme variation of nearly 2,000 feet in a mountain less than four miles in height renders the correctness of the determinations extremely doubtful. With little doubt Mount St. Elias is considerably more elevated than appears on many of the English and German maps (14,975 feet), but in how near it approaches the height of the Mexican volcanoes is still a question for future solution. The existing evidence seems to point to the "Star Mountain" of Mexico, the peak of Orizaba, with its 18,200 feet, as the culminating point of the North American continent.—*Philadelphia Ledger.*

GEOLOGY AND PALEONTOLOGY.

The Origin of the Sycamore.—The American origin of our sycamore was long denied by European botanists, and was only rendered certain by its discovery in a fossil state by Prof. Lesquereux in a late deposit of the Mississippi valley. Specimens were sent to that great authority on these subjects, Dr. Oswald Heer, of Zurich, who could find no characters by which to distinguish the fossil from the living form, and who regards this as a final settlement of the question. But through the researches of Lester Ward we now learn that the genus itself, the entire type of vegetation to which the plants belong, is American, and that numerous and strange archaic forms of this type formed umbrageous forests on the shores of the great inland Laramie sea where the Rocky Mountains stand, and of the ocean at a time when it extended northward across what are now the great plains of the United States and Canada. (Proc. U. S. Nat. Mus., Vol. XI.)

The Cuboides Zone.—In a paper read before the Geol. Soc. Am., Dec. 28, 1889, by H. S. Williams, the author concludes, after a study of the Cuboides zone and the Tully limestone, that within narrow limits, geologically speaking, the point in the European time scale represented by the beginning of deposition of the Cuboides Schichten of Aix la Chapelle and Rüdesheim, is represented in New York sections by the Tully limestone; and second, that the representative of the fauna of the Cuboides zone of Europe is seen in New York, not only in the Tully limestone, but in the shaly strata for several hundred feet above.

Therefore, if we wish to express precise correlation in our classification of American rocks, the line between Middle and Upper Devonian formations should be drawn at the base of the Tully limestone, to correspond with the usage of French, Belgian, German, and Russian geologists, who include the Frasnian, Cuboides Schichten, and correlated zones in the Upper Devonian.

In discussing the subject Mr. C. D. Walcott remarked: "Prof. Williams' paper is of unusual interest, as he has shown very clearly that the theory of Huxley that there is no homotaxial relation between the sub-division of the geologic systems on the American and European continents is not altogether correct. This study of the Cuboides

zone has shown one limited horizon, at least, that is widely distributed in Europe which is also readily recognized in the state of New York."

The Echinodermata of the Carboniferous.—C. R. Keyes, in the *Am. Jour. Sci.*, Sept. 1889, discussing the Carboniferous Echinodermata of the Mississippi basin, recapitulates as follows:

It appears that (1) the most characteristic faunal group was pre-eminently dual in its general aspect, the Crinoidea greatly predominating during the first part and the Blastoidea during the latter portion of the period; (2) that a large proportion of the genera of Echinoderms became extinct toward the close of the Keokuk; (3) that of the Crinoidal genera represented in the St. Louis and Chester, nearly one-half of the number did not occur in the earlier epochs; (4) that among the Crinoidea in general the abrupt and extensive differentiation in certain anatomical features toward the end of the Keokuk are suggestive of decided changes in the biological and physical conditions of environment; (5) that the faunas of the Burlington and Keokuk are very closely related genetically, the two being practically continuous; (6) that if the members of the Lower Carboniferous of the Mississippi are to be synchronized with the two divisions of the Appalachian Lower Carboniferous, the line of demarkation is far more apparent at the close than at the beginning of the Keokuk epoch.

A Recent Find of Castoroides.—Interest attaches to a recent find of *Castoroides ohioensis*, since the species, though known since 1838, has heretofore been studied from rather meagre fragments. This find, which was made in Indiana is well nigh a complete skeleton.

The parietal and occipital regions of the skull are wanting, but they have been well studied already. The dentition, however, is perfect, both above and below, and is more fully developed than in the Clyde skull found in 1840. The vertebræ in front of the pelvis are all present, except two of the dorsal and four of the cervical. The two most important, the atlas and axis, were found.

The shoulder-blades, clavicles, and fore-legs, minus the feet, show an animal powerfully developed anteriorly. The tail is proportionally about as long as that of the beaver. Everything about it indicates that it was an important and powerful member. In the middle and more posterior region the transverse processes are broad, heavy, and bifurcate, as in the beaver, but relatively not nearly so long. If its tail was flat it was not so wide as that of the beaver. It was five-toed and plantigrade.

The fourth metatarsal is the longest and stoutest bone of the series. The fifth does not join to the tarsus, but articulates with the outer under side of the base of the fourth. It could hardly have the skeleton of the foot in so many respects like that of the beaver, and not have been web-footed. The entire length of the foot must have been fully twelve inches.

The general size and character of the skeleton sustain the conclusions of Dr. Wyman and others that the animal was "as large as a black bear."—JOSEPH MOORE, *Richmond, Ind.*

Geological News.—General.—H. A. Wasmuth maintains that in "bedded" mineral deposits no "inversion" or "overlapping" of the strata can take place without fracture and more or less dislocation; and that, in general, the dislocations of the strata take place in one of two ways: either the portion of a mineral deposit on the hanging wall of the fracture or fault is in a lower position than the portion on the foot wall, or it is in a higher position. Occurrences of the former sort are called "transverse faults;" of the latter, "longitudinal faults," or overlaps. (Jour. Franklin Insti., Aug. 1887.)

Prof. N. S. Shaler suggests that the origin of the Florida uplift is in all probability the same as that of the "Cincinnati anticlinal," and that the peculiar sand-ridges found in the lake district have been shaped beneath ocean waters affected by strong currents. If this latter theory is true, then we are compelled to believe that the elevation of the area above the sea level took place with extreme suddenness. The problem in this field is substantially like that which we have in the Kame districts along the southern shore of New England. (Bull. Mus. Comp. Zool., Vol. XVI., No. 7.)

It is proposed by F. H. Knowlton (Proc. Nat. Mus., Vol XII., pp. 601–617), in his revision of the Araucarioxylon, to separate Cordaites from the other Paleozoic woods; and, in accordance with Felix's suggestion, to adopt Endlicher's name Dadoxylon for the remainder, and to restrict the use of Araucarioxylon to the Mesozoic and Tertiary forms.

Cretaceous.—R. T. Hill has published an annotated check-list of the Invertebrate Fossils from the Cretaceous Formations of Texas. It comprises 2 species of Protozoa, 8 Cœlenterata, 16 Echinodermata, 5 Bryozoa, and 59 Lamellibranchiata.

J. S. Diller has discovered a number of sandstone dikes in the Sacramento valley in California. Their position and the peculiar way in which they intersect the Cretaceous sandstones and shales, their banding and the appearance and position of the biotite in the dike rock,

afford conclusive evidence that these dikes record seismic movement during the Tertiary. (Bull. Geol. Soc. Am., Vol I.).

G. M. Dawson proposes (*Am. Jour. Sci.*, March, 1890) the name Nanaimo Group instead of Dr. White's "Vancouver," to designate the equivalent of the Chico Group in the Vancouver Island region.

In the *Am. Jour. Sci.*, Oct. 1889, are some suggestions from G. H. Eldridge as to a method of grouping the formations of the Middle Cretaceous. He proposes to include in the lower of the more general divisions the formations of the Fort Benton and Niobara; in the upper, the Fort Pierre and Fox Hills; for the former no better name can be found than the one now in use, Colorado; for the latter the name Montana is now for the first time proposed. It is, however, etymologically objectionable, because it is found principally on the plains!

R. T. Hill does not concur in the proposed suggestion to abandon the Meek and Hayden sub-division of the Upper Cretaceous. If the beds lose their identity in Colorado, they appear in Texas in a manner which only confirms the original Nebraska section in its characters and succession. (*Am. Jour. Sci.*, Dec. 1889.)

Various widely scattered observations enable G. M. Dawson to state (*Am. Jour. Sci.*, Aug. 1889) that a great earlier Cretaceous formation, beneath the horizon of the Dakota, is more or less continuously developed over a vast tract of country, the eastern edge of which lies to the east of the present line of the Rocky Mountains, from the 49th parallel to the Arctic Ocean, and which is represented to the west as far as the vicinity of the mouth of the Fraser River, the Queen Charlotte's Islands, and in the Yukon Valley beyond the 141st meridian, in the interior of Alaska.

Mesozoic.—After a thorough study of rocks from twenty-six localities in the Connecticut valley, W. M. Davis and C. S. Whittle have come to the conclusion that the eastern trap ranges present a uniform association of the numerous characters of extrusive sheets, while the western trap range as consistently manifests the several characteristics of an intrusive sheet. (Bull. Mus. Comp. Zool., Vol. XVI., No. 6.)

A recent communication from R. Lydekker to the *Quar. Jour. Geol. Soc.*, 1890, contains an account of Iguanodont remains from the Wadhurst clay; a description of a metatarsus of a Megolausaurian (*M. dunkeri*) from the same deposit; and a note in regard to some vertebræ of a Sauropterygian.

In an address to the Cambridge Entomological Club, Jan. 10, 1890, Mr. S. H. Scudder gave the following brief *résumé* of recent knowledge of Mesozoic insects:

"The horizon has been extended of late years by the thorough discussion of the Bavarian insects by Deichmüller and by Oppenheim; by the careful exploitation of a new locality for Triassic insects at Dobbertin, Germany, by F. E. Geinitz; by the considerable number of new generic and specific types of cockroaches from the secondary rocks of England, described by myself; by the repeated though not extensive discoveries of Fritsch in Bohemia, adding interesting material for our very meager knowledge of Cretaceous insects; and by the discovery at Fairplay, Colorado, of a collection of Triassic cockroaches of special importance."

Palæozoic.—According to C. R. Keyes the remnants of an exceedingly rich and varied fauna that once tenanted the littoral zones of a vast Carboniferous sea, are found in the vicinity of Burlington, Iowa. The Gastropods of the Kinderhook beds include upwards of fifteen genera and fifty species. But only two of the generic groups, Platyceras and Straparollus, have thus far been recognized in the Burlington strata, in which there occur eight species of the first genus and two of the second. (Proc. Phila. Acad. Sci., Sept. 1889.)

S. A. Miller and F. E. Gurley have described (*Jour. Cin. Soc. Nat. Hist.*, April, 1890) some fine Crinoids from the Coal Measures and sub-Carboniferous rocks of Indiana, Nevada, and Iowa. A new family name, Eupachycrinidæ, is made to include the genera Eupachycrinus and Delocrinus, each containing two new species, and Ulocrinus, containing three. The remaining 45 new species are referred to 21 genera, of which four are new. This paper embraces more important novelties than any one recently published. It is well illustrated.

In the *Quart. Jour. Geo. Soc.*, May, 1890, two new species of Rhachitomous Stegocephali are described and figured by R. Lydekker, viz.: *Macromerium scoticum*, from the Carboniferous of Scotland; *Eryops owenii*, from the Karoo system of South Africa. The latter is the first representative of the North American Stegocephali found at the Cape.

W. B. Dwight has demonstrated from fossils collected in that region that the Calciferous is one of the most prominent components of the Millerton-Fishkill limestone belt.

Cænozoic.—In a paper entitled Structure and Origin of Glacial Sand Plains (Bull. Geol. Soc. Am., 1890) W. M. Morris states that

his observations of the New England sand plains are in accordance with the generally accepted explanations.

E. T. Newton has recently described some Eocene siluroid fishes, *Arius crassus*, *Arius baroni*, and *Arius gagorides*. (Proc. London Zool. Soc., 1889.)

The Cernaysian Mammalia are reviewed in Proc. Phila. Acad. Sci., 1890, by H. F. Osborn. The collection is in the private museum of Dr. Victor Lemoine, and is not thoroughly known or appreciated abroad, except by those who have had the good fortune to examine the original types.

W. B. Clark (Bull. Geol. Soc. Am., Vol. I.) notes the strange commingling of different faunas in the Tertiary deposits of the Cape Fear region.

In a paper on Glacial Phenomena in Canada, Robert Bell discusses the causes of changes in level, and remarks that the elevation of the land still in progress in north polar regions indicates that we have passed the period of greatest warmth, and that a colder condition has again begun to creep upon us from the north.

G. F. Wright (Bull. Geol. Soc. Am., Vol. I.) defines the Oak Knolls, a part of the ridge separating Lake Ontario from Lake Huron, as a moraine of retrocession. This ridge probably existed as a long island in the great glacial Lake Erie-Ontario.

T. C. Chamberlin (Bull. Geol. Soc. Am., Vol. I.) presents some additional evidences bearing on the interval between the glacial epochs. These evidences are the trenching of the valleys of the Mississippi, Ohio, Allegheny, Susquehanna, and Delaware Rivers. The cutting of these trenches rudely measures the length of the interglacial interval.

At a meeting of the Phila. Acad. Sci., 1888, Otto Meyer determined a collection of fossil Tertiary invertebrates imbeded in sand which filled the inside of a *Balanus convexus* Brown, found on the west side of Chesapeake Ba[illegible]. The list comprises 15 Gastropoda, 8 Lamellibranchiata, 1 Balanidæ, 1 Ostracoda, 3 Foraminifera.

R. Lydekker, in a recent paper (*Quart. Jour. Geol. Soc.*, 1890), submits sufficient evidence to prove beyond reasonable doubt the occurrence of the striped hyæna in the Tertiary of Val d' Arno.

G. M. Dawson calls attention (*Geol. Mag.*, Vol. I.) to the noteworthy heights at which glaciation has now been found to occur on some of the higher points in the southern interior of British Columbia. These heights range from 4340 to 7200 feet.

A recent study of the corresponding series of beds in the Paris and Hempstead basins leads Mr. A. Blytt to think that the attenuation of strata was effected by a general cause, and it seems highly probable that this cause is the precession of the equinoxes.

In the Proc. N. Y. Microscopical Soc., 1890, is found a synopsis of the Cretaceous Foraminifera of New Jersey, compiled by Anthony Woodward. The object of this paper is to bring together all the work that has been previously done, and the observations that have been made on the Cretaceous Foraminifera of New Jersey from 1833 to 1889.

Joseph Moore (*Jour. Cin. Soc. Nat. His.*, April, 1890) describes the tooth of a gigantic rodent found in northern Georgia. Its striking feature is the peculiar ribbing and flutting of the enamel throughout the length of the tooth. He proposes the name *Castoroides georgienis*. After an examination of the specimen, Prof. Cope states that it is the inferior canine of the *Hippopotamus amphibius*.

MINERALOGY AND PETROGRAPHY.[1]

Petrographical News.—A suite of rocks collected in Madagascar by Rev. R. Baron [2] has been examined by Hatch,[3] who separates them into gneisses, granitite, olivine-norite, pyroxene-granulites, pyroxenites, and basalts. In the olivine-norite the plagioclase is perfectly transparent, and has an undulous extinction. The olivine is surrounded by a reactionary rim consisting of an inner zone of hypersthene and an outer one of actinolite. The pyroxene-granulite is evidently a basic eruptive that has suffered dynamo-metamorphism. It contains pyroxene, hornblende, and garnet, besides the usual constituents of granulite. Among the basalts many varieties are described. In one variety, the augite and olivine, when present, are in porphyritic crystals, slightly corroded, and including portions of the microlitic ground mass. The augite is grouped around the olivine, which is twinned. A few grains of quartz are present. A second variety contains hornblende and biotite porphyritically developed. All the augite of this rock is zonal, with a different extinction in the various zones. In some the hour-glass structure was observed. Twinning is frequent. A glassy basalt includes hornblende crystals and fragments of quartz. Some of the hornblende has been entirely dissolved, and in its place has been formed an aggregate of augite and magnetite.

[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

[2] *Quart. Jour. Geol. Soc.*, XLV., May, 1889, p. 305.

The quartz fragments are surrounded by zones of colorless glass containing augite microlites, which are in turn surrounded by zones of brown glass enclosing microlites and crystals of augite and granules of magnetite.——According to Vénukoff,[4] basalts play an important role in the geology of Mongolia. They consist principally of feldspar, augite, olivine, ilmenite, and magnetite. The feldspar is usually in but one generation. When in two, the phenocrysts are anorthite and the microlites labradorite. The augite is usually in two generations, the larger crystals being violet in color, while the smaller ones are green. In some cases the porphyritic augites are made up of an aggregate of small grains grouped in such a way as to present the outline of crystals. These aggregates are sometimes surrounded by a rim of grains of the second consolidation. Between the minerals above mentioned there is often a little of an amorphous base containing globulites and microlites. The quartz of an inclusion of granite in this basalt is surrounded by a zone composed of augite and small, light-colored microlites. The biotite of the granite has been transformed into a granular mass of magnetite, quartz, and a light brown opaque substance. Around it is often a zone of augite grains. Around the feldspar the basalt paste becomes light colored, the crystal components are more rare, and in their places are various microlites. Within this is a band of augite microlites, and within this band, immediately surrounding the feldspar, is a zone of colorless glass. The feldspar itself is much fractured.——The greenstones[5] of Wicklow, Ireland, occur in intrusive sheets and dykes. They are quartz-mica-diorites (composed of quartz, plagioclase, orthoclase, biotite, hornblende, and a little malacolite, chlorite, and apatite), quartz-diorites, diorites, augite-diorites (consisting of plagioclase and grains and crystals of sahlite or malacolite), diabases, epidiorites, chlorite-schists (produced by dynamic metamorphism from diabase), and serpentines, derived from diabases.——Mr. Somervail[6] regards the gabbros, greenstones, granulites, and hornblende-schists of the Lizard, Eng., as parts of the same rock-mass, the latter-named rocks, according to him, having originated from the former by pressure.——Mr. Marstens[7] gives us a very brief description of diabases and diabase porphyrite from among the Triassic traps of Nova Scotia.——A few dykes[8]

[3] Ib., p. 340.
[4] Proc. verb. soc. Bélg. de Géol., II., 1888, p. 441.
[5] *Geol. Magazine*, 1889, p. 261.
[6] *Geol. Magazine*, Sept. 1889, p.
[7] *Amer. Geol.*, Mch. 1890, p. 140.
[8] Darton and Diller. *Amer. Jour. Sci.*, Apr. 1890, p. 269.

occurring in the Upper Silurian and Lower Devonian beds of the Appalachians in Highland Co., Va., consist of porphyritic basalt composed of phenocrysts of augite and olivine in a ground-mass of plagioclase, augite, magnetite, and a few flakes of biotite.——Sandberger [9] mentions cordierite occurring as an inclusion in the basalt of the Calvarienberg, near Fulda, in Hessen. He also gives an analysis of the phonolite of Heldburg, near Coburg.——Holland [10] has isolated the porphyritic crystals from the basalts of Mull, Eng., and finds them to correspond in composition and other properties with anorthite of the composition $AbAn_3$.——In the phonolite of the Serra de Tingua, Brazil, are coarse-grained patches with the structure of foyaite. They have the form of leucite crystals, and are, according to Hussak,[11] nothing more or less than pseudo-crystals of this mineral. They consist of a thin wall composed of crystals of orthoclase, surrounding a coarse-grained aggregate of the constitution of foyaite. The external form of the pseudomorphs is so perfect that the angles of leucite can readily be detected upon them.——Mr. C. W. Hall [12] records the fact that the Trenton limestone of St. Paul and Minneapolis., Minn, is composed of untwinned rhombohedra of calcite. An argillaceous bed lying above the limestone contains many rhombohedra of calcite imbedded in its matrix.——Dr. Lawson [13] describes an amygdaloidal trap from the Animikie series of Thunder Bay, Canada, that contains about 2% of native copper.

Mineralogical News.—NEW MINERALS.—*Inesite.*—At the mine Hilfe Gottes and Ferdinand, near Nanzenbach in the Dillenburg region, Germany, is a new manganese mineral associated with various ores of this metal. The new mineral is a dense colorless to dark brown substance, whose hardness varies between 5 and 6, and whose streak is yellowish-brown. Its fusibility is 3. In other specimens the mineral occurs in radial aggregates of a flesh-red color, with a hardness of 6–7, a specific gravity of 3.103, a white streak and a glassy lustre. It has an extinction of 20° against one of its cleavages, and is regarded by Schneider [14] as triclinic. Its composition is

SiO_2	Al_2O_3	FeO	MnO	MgO	CaO	H_2O
43.92	.29	.69	38.23	.28	8.00	8.49

[9] *Neues Jahrb. f. Min.*, etc., 1890, I., p. 101.
[10] *Miner. Magazine*, Mch. 1889, p. 154.
[11] *Neues Jahrb. f. Min.*, etc., 1890, I., p. 166.
[12] Bull. Minn. Acad. Nat. Sciences, Vol. III., No. 1., p. 111.
[13] *Amer. Geologist*, Mch. 1890, p. 174.
[14] *Zeits d. deutsch. geol. Ges.*, XXXIX., 1889, p. 829.

In many of its characteristics it resembles rhodotilite. Its axial ratio, as calculated by Scheibe,[15] is $a : b : c = .9753 : 1 : 1.3208$, with $\alpha = 92° 18' 12''$, $\beta = 132° 55' 54''$, $\gamma = 93° 50' 42''$.——*Rhodotilite* is described by Flink[16] from the Harstig mine, Pajsberg, Sweden. It is identical in all its properties with inesite, but is fresher. Its analysis gave:

SiO_2	FeO	MnO	MgO	CaO	PbO	H_2O
43.67	1.11	37.04	.15	9.38	.77	7.17

which corresponds with the formula 2 (MnCa) $SiO_3 + H_2O$. Recognizing the similarity between *rhodotilite* and the mineral described by Schneider under the name *inesite*, Flink has determined to withdraw the former name and has decided to adopt the one proposed by Schneider.——*Lussatite* is described by Mallard[17] as a milky-white fibrous substance surrounding quartz crystals, occurring in the bituminous beds of Lussa, Pont-du-Chateau, France. The fibres are arranged perpendicularly to the bounding planes of the quartz. They have a density of 2.04, and contain 7.9–8.3% of water, which they lose when heated without changing their optical behavior. The loss of water is supposed to be due to a mixture of opal with the fibrous mineral, which the author regards as crystallized silica differing from quartz and chalcedony, since it possesses optical properties that differ from those of these minerals. Its index of refraction for sodium light is 1.446.——*Heliophyllite*, from Pajsberg is a shining, sulphur-yellow, flaky substance[18] accoompanying the *inesite* (rhodotilite) from the Harstig mine. It resembles, in appearance, a mineral described by Nordenskjöld[19] as associated with *ekdemite* at Långban. The new mineral is orthorhombic, with the plane of its optical axes normal to the cleavage face. The axial angle is large, and the dispersion $\rho > v$. The density is 6.886, and hardness 2. On the Långban mineral the planes $P\breve{\infty}$ and oP occur on twinned forms, with ∞P the twinning plane, and $a : b : c = 1.0343 : 1 : 2.2045$. Heliophyllite has practically the same composition as *ekdemite*, from which, however, it differs in its crystallographic properties.

	PbO	MnO. FeO	As_2O_3	Cl
Heliophyllite	80.70	.54	11.69	8.00
Ekdemite	81.28		12.03	8.63

[15] Ref. *Neues Jahrb. f. Min.*, etc., 1890, I., p. 21.

[16] Öfv. af. Kongl. Vetensk. Ak., För. 1888, Stockholm, p. 571. ref. *Neues Jahrb. f. Min.*, etc., 1890, I., p. 22.

[17] Comptes Rendus, 110, p. 245. Ref. Ber. d. deutsch. chem. Ges., 1890, p. 170.

[18] Flink: Öfversigh. af. Kongl. Vetensk. Akad. Förh., 1888, Stockh., p. 571.

[19] Geol. Fören. Förh., III., p. 381. Ref. *Neues. Jahrb f. Min.*, etc., 1890, I., p. 23.

——*Barysite.*—At the same Harstig mine Sjögren and Lundström [20] have found a lead silicate associated with garnet, calcite, tephroite, hedyphane and cerussite filling a vein in the iron ores. The mineral occurs in silver-white hexagonal crystals, with a perfect cleavage parallel to oP, and a less perfect one parallel to ∞P. Its double refraction is negative, streak white, hardness, 3, and specific gravity, 6.55. When heated it becomes dark and melts to a brown glass. Dissolves in nitric and hydrochloric acids with the separation of gelatinous silica. Its composition (as a mean of two analyses) is:

SiO_2	PbO	MnO	FeO	CaO	MgO	Ce	Loss.
17.07	78.26	3.51	.16	.41	.59	tr.	.89

leading to the formula $3\,(\frac{1}{6}\,MnO+\frac{5}{6}\,PbO)\;2\,SiO_2$.

Miscellaneous.—The second part Hintze's "Handbuch der Mineralogie" [21] concludes the discussion of the topaz group of minerals, and treats of the datholite and epidote groups, vesuvianite, gehlenite, and parts of the tourmaline group. The fullness of treatment that characterized the first part of this remarkable book is continued in the second part. If the promise given by the two parts that have appeared to date is carried to its fulfillment, the complete volume will be a marvel of painstaking labor and patience.——A discussion of some of the facts known with respect to the physical symmetry of crystals, together with some observations made upon the gypsum of Zimmerscheim, in Upper Alsace, lead Beckenkamp [22] to the view that the molecules of crystals are polar, *i.e.*, that they possess different powers at diametrically opposite points, and that, other conditions being similar, a crystal face always possesses a maximum tendency to growth in a certain fixed direction.——In a conglomerate on the Coast of South Devon, near Torquay, England, are numerous pieces of limestone, on the surface of which are botryoidal and spherulitic forms of chalcedony, known as beekite. These are thought by Hughes [23] to have originated by the replacement of portions of the limestone by silica, possibly through the influence of organic substances. The author thinks that the same kind of action may have given rise to many of the old siliceous deposits like flint or chert ——Mr. Dawson [24] has recently given a statement of the present condition of mining in British Columbia, and a description of the minerals of economic value occurring there, and Mr. Coste [24] has issued a statistical

[20] Öfvers. af. Kongl. Vetensk. Ak. Förh., p. 7. Ref. *Neues. Jahrb. f. Min.*, etc., 1890, I., p. 24.

[21] Dr. C. Hintze: Handbuch der Mineralogie, 2d Lief. Leipzig. Veit and Comp., 1890.

[22] *Zeits. f. Kryst*, XVII., 1890, p. 321.

[23] *Miner. Magazine*, Oct., 1889, p. 265.

[24] Ann. Rep. Geol. and Nat. Hist. Surv. of Can. for 1887-88. Reps. R and S.

report on the mineral products of Canada.——In the tourmaline of the tourmaline granite of Striegau, Traube[25] has discovered pleochroic halos around inclusions of rutile and zircon. The color of the halos is some shade of violet, and is independent of the color of the mineral in which they lie. It disappeares upon heating. Garnet, apatite, and quartz inclusions in the same tourmaline are not surrounded by halos.—— Among the new instruments, and improvements upon old instruments, used in crystallographic and mineralogical investigations, that have been suggested during the last three months, mention may be made of an apparatus[26] for the production of pressure figures in very small mica plates; of a very simple reflection goniometer constructed by Prof. Groth[27]; of an improved instrument[28] for cutting thin sections of minerals in any desired position; and an improved heating apparatus for use with the reflection goniometer, invented and constructed by the well-known mechanician Fuess.[29]

BOTANY.

Note on a New Species of Actinoceps B. and Br.—In the Sylloge Fungorum of Saccardo but a single species of Actinoceps is recorded, and this is a native of Ceylon. Consequently it is interesting to discover that another form, undoubtedly belonging to the same peculiar genus of Hyalostilbeæ, occurs rarely in Minnesota. In April a number of moist chambers were prepared by Mr. E. P. Sheldon in the botanical laboratory of the University of Minnesota. In these chambers a large variety of nutritive substances were placed, and a number of more or less interesting saprophytic fungi have since developed.

The plant, referred to Actinoceps, developed upon the glandular side of a putrescent orange-peel, and formed a little colony of somewhat less than a square inch in extent. The surface of this area, upon examination, was found to be clothed with a thin layer of *Bacillus megaterium* De By., together with other saprogenic bacteria. From this thin layer of micro-organisms the Actinoceps plants arose in num-

[25] *Neues Jahrb. f. Min.*, etc., 1890, I., p. 186.
[26] Steenstrup: Geol. Fören. Förh., Stock., 1888, p. 113. Ref. *Zeits. f. Kryst.*, XVII., p. 429.
[27] *Zeits. f. Kryst.*, XVII., 1890, p. 396.
[28] Ib. XVII., 1890, p. 445.
[29] *Neues Jahrb. f. Min.*, etc., 1890, I., p. 161.

bers, although never so close as to touch each other. The networks of hyphæ at the base of each Actinoceps stipe were found to interlace among the bacilli, and to ramify somewhat widely through the nutritive material. In general the appearance of each stroma was more or less glaucescent, varying in a few individuals to a faint and very light yellow color.

For comparison a transcription of the Saccardian description is given here in English. The original will be found on p. 579 of Vol. IV., and the single species described is "No. 2747."

"Actinoceps B. and Br., Suppl. Fungi of Ceylon . . . Stipe hyaline, cylindrical, composite; hyphæ repeatedly branched and accumulated in a globose head, with radiating spicules; hyphæ sometimes prolonged into radiating, vitreous, granulate spicules, again developed as very slender conidiophores; conidia very minute hyaline.

"*Actinoceps thwaitesii* B. and Br. Stipe 400 to 500 μ in length; head, 140 to 160 μ in diameter; spicules shaped as in sponges, covering the head rather loosely with spines; spore-bearing hyphæ repeatedly branched, sub-flexuose; conidia elliptico-spheroid.

"Hab. In decayed, leathery leaves, Ceylon."

From this it will be seen that the genus Actinoceps differs little from Stilbum, the spicules of the former constituting the diagnostic character. Like Stilbum, the Actinoceps studied in Minnesota has the conidia enclosed within a mucilaginous layer, so that the younger plants generally present a somewhat shining aspect, while the older ones are slightly desiccated, and appear sub-pulverulent.

Comparing the Minnesota Actinoceps with the description of the Ceylonese form certain minor differences in size are noted. Since spore and hypha measurements are omitted in the description of *Actinoceps thwaitesii*, the comparison extends only to the stromatic measurements. While the Ceylonese form shows a stipe 400 to 500 μ in length, that of the Minnesota form is from 700 to 700 μ. The diameter of the head in *Actinoceps thwaitesii* is 140 to 160 μ, while that of the Minnesota form is much larger, measuring from 360 to 400 μ. Additional measurements of the stalk showed its average diameter to be between 45 and 55 μ. From this it is apparent that the Minnesota specimens should be separated from the Ceylonese species, and a description of the American form is appended.

Actinoceps besseyi n. s. Stalk 400 to 700 μ long, 45 to 55 μ in diameter, cylindrical, smooth, hyaline, compacted; head sub-globose, pale glaucescent, armed loosely with projecting spicules, 360 to 420 μ in diameter; spore-bearing hyphæ repeatedly branched, sub-flexuose, 4

μ in diameter, bearing the conidia occogenously. Conidia ellipsoid to elliptico-spheroid, $4 - 5 = 2 - 2\frac{1}{2}$ μ. Spicules with cell-walls somewhat thickened, often septate prolonged, sometimes 100 μ beyond the surface of the globose capitulum.

Hab. On putrid orange-skin among bacteria, Minneapolis, Minn.

It should be noted in passing that the specimens of *Actinoceps besseyi* observed by us were sometimes grown over by a cobwebby network of Diplosporium filaments, which bore occasional spores, but were collected more abundantly on the wet paper in the bottom of the moist chamber, where they formed a luxuriant growth. The Diplosporium was referred doubtfully to *D. album* Bon., from which it differs slightly in the spore measurements.

The Actinoceps above described is dedicated to Dr. Charles E. Bessey, the well-known botanist.—CONWAY MACMILLAN, *University of Minnesota.*

Notes on the Canyon Flora of Northwest Nebraska.—Our party left Lincoln June 17th, and arrived at the Pine Ridge Tunnel early on the morning of the 18th. In the walk from there to Crawford about the only thing of interest found was a very large form of *Viola canadense* L. with a very small flower. In many places this was almost entirely killed by *Æcidium violæ*. In many cases the plant leaves and stems were twisted all out of shape by the fungus.

From Crawford to Harrison brought nothing of interest. Leaving Harrison we pitched our tent in War Bonnet Cañon. Here new things and new variations were continually turning up. One peculiarity of the cañon flora quite noticeable was the difference—in many cases very pronounced—between the floras of the different side cañons. Many plants were found in one cañon and in that one only, though there were many cañons very similar to it. In one cañon *Pyrola chlorantha* Schwarz was found in a considerable quantity, but in one only. In another *Pyrola secunda* L. grew. Some cañons have any quantity of *Populus tremuloides* Michx., others scarcely any.

In nearly all of the cañons, especially the damper, darker ones, *Corallorhiza multiflora* Nutt. grew quite plentifully; while only the darkest cañons afforded the rare *C. innata* R. Br. In a small cañon at the head of Jim creek was found a lavender-yellow variety of the former species. *Habenaria bracteata* R. Br. grew in abundance along the low banks of all the cañon streams. The dry cliffs and slopes of the cañons were covered with the lovely *Calochortus nuttallii* Torr. and Gray. *Fritillaria atropurpurea* Nutt. occurred plentifully in a few

localities, but was generally out of bloom. *Mertensia lanceolata* D.C. was found growing among the short underbrush of the second banks in War Bonnet Canyon.

The weather was too dry for lichens and most of the fungi. Of the former, several interesting Cladoniæ were found together with two or three species of Peltigera. On the north slopes of the dampest cañons *Parmelia olivacea* (L.) Ach., and a sterile form of *Usnea barbata* (L.) Fr., grew very plentifully on the pines everywhere.

Various species of Æcidium and Uromyces occurred generally in large quantities; the most plentiful being *Æcidium abundans* Pk., *Æcid. clematidis* D.C., *Æcid. grossulariæ* Schum., *Uromyces trifolii f. glycyrrhizæ* E. & E., and also *Gymnosporangium clavariforme* (Jacq.) Rees., I., was found quite plentiful in a small side cañon of the War Bonnet, on *Amelanchier canadensis*. Along the higher lands and buttes above the cañons *Ustilago carices* (Pers.) Fück, was found in large quantities. Out on the Hat Creek Basin *Ustilago hyphodytes* (Schlect) Fr., which is considered a rare species, occurred in considerable quantities on *Stipa comata*. Several interesting rock forms of lichens were found on the rocks cropping out near the edge of the "bad lands;" the most plentiful as well as the most beautiful being *Lecanora rubina* (Vill.) Ach. and *L. rubina* var. *opaca*. Ach., Fr. and *Placodium* Sp., near *P. elegans* (Linta) D.C. Many rocks being literally covered by these with a few others.—Tom A. Williams, *Ashland High School, Nebraska.*

Botanical News.—Professor McLaren, of the Maryland Agricultural College, has had his copies of Gray's Manual bound in oil cloth, a decided improvement over the soft and rather bibulous cloth cover usually given the book by the publishers. Now if the margins could be trimmed down it would improve it still more. . . . The fourth number of the memoirs of the Torrey Botanical Club is devoted to a paper by Dr. E. Lewis Sturtevant on "Seedless Fruits." Sixty-one species are mentioned in the paper. The general result appears to be that a tendency to seedlessness is an accompaniment of high development . . . H. S. Jennings published an annotated list of ninety-five parasitic fungi of Texas, in the ninth bulletin of the Texas Agricultural Experiment Station. . . . G. N. Best has examined (Torrey Bulletin for June, 1890) some of the North American roses—those belonging to the group Cinnamomeæ,—and among other changes reduces *Rosa arkansana* Porter, to a variety of *Rosa blanda* Ait., as *R. blanda* Ait., var. *arkansana* (Port.) Best. This reduction, it will be remembered, was suggested by Watson five years ago in Proc. Am.

Acad. Arts and Sci., Vol. XX., p. 336. . . . *Masclef's Atlas des Plantes de France utiles, nuisables et ornamentales* has reached Part X., and continues its promise of excellence. The later numbers have contained notably fine colored figures of *Ononis spinosa, Medicago sativa, Colutea arborescens, Pisum sativum, Coronilla varia, Amygdalus communis, Persica vulgaris, Prunus spinosa,* and *Cerasus vulgaris.* . . . Parts 44 and 45 of Engler and Prantl's *Die Naturlichen Pflanzenfamilien* continue the Euphorbiaceæ, complete the Myrsinaceæ, Primulaceæ, Plumbaginaceæ, and begin the Sapotaceæ. The last-named order is elaborated by Engler, the others by Pax. . . . Professor Gardiner and Mr. Brace published in the Proc. Acad. Nat. Sci. Phil. an interesting provisional list of the plants of the Bahama Islands. . . . Another of the numerous valuable contributions from the Cryptogamic Laboratory of Harvard University has made its appearance in Proc. Am. Acad. Arts and Sciences, Vol. XXV., p. 53, by Wm. A. Setchell, on the "Structure and Development of *Tuomeya fluviatilis*, a red seaweed (*Florideæ*) intermediate between Lemanea and Batrachospermum. . . . The May number of *Pittonia* is an unusually interesting one, dealing as it does in its peculiarly sprightly way with half a dozen or more topics. The review of the new edition of Gray's Manual contains much plain talking, some of which may be deserved, while much certainly is not.

ZOOLOGY.

Snakes in High Places!—A discussion occurred some time ago in THE NATURALIST upon the question, "Do Snakes Climb Trees?" to which I contributed one or two items. But just now my farmer friend, Hiram Carpenter, who lives three miles out of town, invited me to call at his place and see where he found a snake four feet and three inches in length and one and a half inches in diameter. The swallows nest under the eaves of his barn, which project some twenty inches from the building. The rafters do not run out more than one-half or two-thirds of this distance, the space between them being quite thickly studded with the mud-nests of the swallows. One pleasant day in June his son noticed quite a commotion among the birds, and called him to the spot. They were amazed to see a large snake clinging to the end of a rafter, with its head in one of the nests, evidently devouring the young birds. The reptile was able to cling to the end of the rafter by hugging it tightly, and was only dislodged after some effort.

It had swallowed two young birds, and another was part way down its throat. The young man had not "believed in killing snakes," but on this occasion he despatched the reptile forthwith. The barn is sheeted up with rough pine boards, upon which there are two coats of paint, and from the ground to the point whence the snake was dislodged the distance is nineteen feet and four inches. How it managed to get to the spot seems altogether a mystery. There was no hole through the side of the barn nor under the roof boards, nor did it seem possible for it to have worked its way from the top of the roof. Then, it was quite as difficult for it to have found a way to the roof. Mr. Carpenter is a most reliable observer of all natural phenomena,—an investigator, really,—but he was unable to form any opinion as to how the reptile reached its prey. He described it as resembling the common garter-snake, except in the matter of its great size, hence I could form no idea as to the species to which it belonged.—CHARLES ALDRICH, *Webster City, Iowa, July, 14, 1890.*

Snakes in Banana Bunches.—Banana bunches brought from tropical America sometimes contain snakes of the family Boidæ, tightly wound round the central stem. A specimen of this kind was taken in Savanna, Georgia, and was sent to the United States National Museum. I identified it as the *Epicrates angulifer,* a native of Cuba. More recently a snake was found in a similar situation in a lot of bananas in Chicago, and was sent by Dr. J. L. Hancock to the National Museum. Dr. Stejneger has identified it as the *Boa imperator,* the common species of Central America and Mexico. The specimens are always young, as adult boas of the genera named could not be concealed in so small a space.—E. D. COPE.

ENTOMOLOGY.

Recent Literature.—Several notable entomological articles have been recently issued by the National Museum. Mr. Henry Edward's Bibliographical Catalogue of the Described Transformations of North American Lepidoptera, which forms Bulletin No. 35, is a very useful compilation, and ought to stimulate the study of the earlier stages of the group. There are 1,069 species included in the Catalogues, the Tineidæ heading the list with 222 entries, and Zygænidæ bringing up the rear with 13 entries.

Another valuable paper is the Catalogue of the Described Araneæ of North America, by George Marx, which forms No. 782 of the Museum Proceedings, and covers about one hundred pages. The author deserves the thanks of all arachnologists for this careful piece of work.

Other Museum Proceedings contain descriptions by Mr. Lawrence Bruner of New Acrididæ, including the characterization of the three new genera, Dracotettix, Eritettix, and Boötettix; revision of some Tæniocampid Genera by John B. Smith; and descriptions of New Ichneumonidæ by William H. Ashmead.

Professor Alfred Giard has published in the Bulletin Scientifique de la France and de la Belgique an interesting article entitled Sur Quelques Types Remarkables de Champignons Entomophytes. Three colored plates, representing *Entomophora saccharina*, *E. calliphoræ*, *E. plusiæ*, and *Polyrhizium leptophyci* infesting their respective hosts, accompany the paper.

The report of the U. S. Entomologist for 1889 contains accounts of the Fluted Scale (*Icerya purchasi*), Six-spotted Orange Mite (*Tetranychus 6-maculatus*), Horn Fly (*Hæmatobia serrata*), and the Grain Aphis (*Siphonophora avenæ*). A brief synopsis of the work of the division and its agents is given.

Mr. Lawrence Bruner has published in the Bulletin of the Nebraska Experiment Station (Vol. III., Article II.) an extended paper on Insects Injurious to Young Trees on Tree Claims, which will prove useful to western planters.

A New Phalangium.—In a lot of harvest-spiders received from Mr. C. W. Woodworth, Entomologist of the Arkansas Experiment Station, I found a number of specimens of a remarkable species of Phalangium, in which the sexes are very different, the male having extremely long palpi, and the second joint of its cheliceræ being articulated with the first at the middle, so as to form a right angle, while in the female the palpi are but little longer than usual, and the second joint of the cheliceræ is articulated with the first at the end in the ordinary manner. The species may be called *Phalangium longipalpis*. This case is exactly analogous to that of *Phalangium opilio* of Europe, in which the two sexes are similarly distinguished.

DESCRIPTION.—*Male.*—Body 7 mm. long; 3.5 mm. wide. Palpi 20 mm. long. Legs: I. 30 mm.; II. 47 mm.; III. 30 mm.; IV. 38 mm.

Dorsum light mottled gray, with a darker central marking beginning at the eye eminence, and expanding rapidly to margin of abdomen,

then suddenly contracting and again expanding on the first two abdominal segments; suddenly contracting on the third and running as a broad stripe to posterior extremity. Scattered over the dorsum of the cephalothorax are numerous tubercles, having whitish bases and black tips, and generally having also a black spinose hair arising on one side of the tubercle near the apex of the white portion, and extending beyond the tip of the tubercle; a transverse row of similar tubercles on each abdominal segment. Dorsum of abdomen covered with numerous small black granules. Eye eminence gray, well developed, canaliculate, each carina surmounted by a well-marked series of tubercles, whitish with black tips. Cheliceræ large, light brown, with tips of claws black; first joint long, cylindrical, convex, furnished above with black spinose tubercles; second joint very large, smooth, except for some black spinose hairs, articulated at a right angle with the first, prolonged above in the form of a large conical horn, curved forward. Palpi slender, very long (three times as long as body), smooth, except for rows of stiff black hairs; light brown, except middle portion of femur, which is black. Ventrum, including coxæ, grayish white, with numerous black hairs. Trochanters light brown, almost whitish, with a few tubercles. Rest of legs brown, with femora darker; proximal joints with rows of spinose tubercles.

Female.—Body 7.5 mm. long; 4.5 mm. wide. Palpi 6.5 mm. long. Legs: I. 21 mm.; II. 36 mm.; III. 23 mm.; IV. 32 mm.

Dorsum light mottled gray, with a rather distinct darker central marking beginning at anterior border of abdomen, and expanding rapidly on the first two segments; suddenly contracting on the third segment and running as a stripe to the posterior extremity. Scattered over the dorsum of the cephalothorax are numerous tubercles, having whitish bases and black tips, and generally having also a black spinose hair arising on one side of the tubercle near the apex of the white portion, and extending beyond the tip of the tubercle. A transverse row of similar tubercles on each abdominal segment. Dorsum of abdomen having numerous small black granules. Eye eminence well developed, gray, canaliculate, each carina surmounted by a well-marked series of tubercles like those on the dorsum. Cheliceræ light brown, dorsal proximal portion of first joint mottled with chocolate brown; tips of claws and a blunt tubercle at base of outer claw, black; both joints furnished with scattered black, spinose hairs. Palpi rather long (but very much shorter than in male), slender; very light brown, almost whitish, with middle of femur black; all the joints furnished with well-developed spinose hairs, those on the tarsus being more

PLATE XXVII.

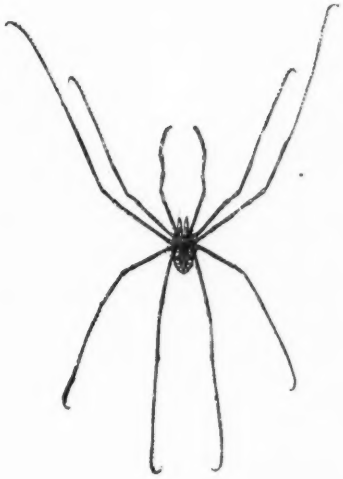


Fig. 1.

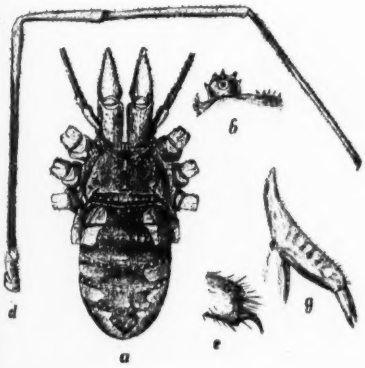


Fig. 2.

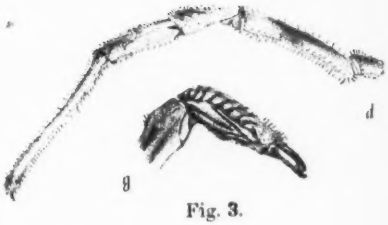


Fig. 3.

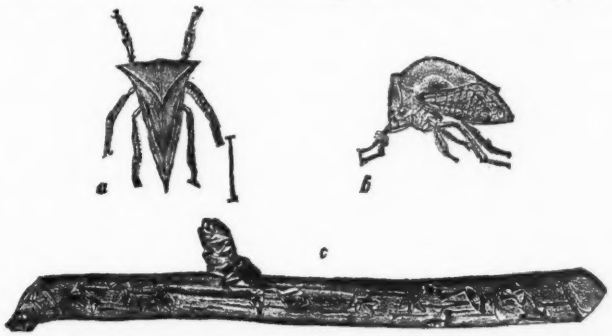
Phalangium longipalpis.

slender than others; claw of tarsus not denticulate, moderately robust. Ventrum, including coxæ, grayish white, with numerous black hairs. Trochanters very light brown, almost whitish. Legs light brown; femora provided with rows of spinose tubercles; tibiæ angular, with rows of fine hairs on angles.

Described from many specimens.

In the accompanying Plate, Fig. 1 represents the male, natural size, while at Fig. 2 are shown the parts magnified, The letters *a*, *b*, *d*, *e*, and *z* show respectively a dorsal view of the body, and a side view of the eye eminence, the palpus, the palpal claw, and the chelicera of the male; while in Fig 3, *d* and *g* represent similar views of the palpus and chelicera of the female.—CLARENCE M. WEED.

Injuries of Buffalo Tree-Hopper.—This insect (*Ceresa bubalus*) has become a serious pest in many parts of Ohio. It is only comparatively lately that it has attracted special attention as a destructive insect, Professor Popenoe having described its work in Kansas about five years ago. During the last winter I have received twigs injured by the egg-punctures of the insect from three counties of the state, and in each of the orchards much damage had been done. Apples and



BUFFALO TREE-HOPPER.—*a*, back view; *b*, side view, both slightly magnified; *c*, apple twig showing egg-punctures.

pears are both attacked. The insect is represented, slightly magnified, at *a* and *b* of the accompanying figure, while at *c* is shown a twig partially covered with the egg punctures of the insect.—C. M. W.

The Maple Bark-Louse.—This insect (*Pulvinaria innumerabilis*), which was so destructive in the central western states about six years ago, is again appearing above the danger line. In some of the leading cities of Ohio it is present on the trees in great numbers, and is causing considerable alarm.

SCIENTIFIC NEWS.

An important scientific expedition left Minneapolis on the 22d of July. Messrs. D. C. Worcester and F. S. Bournes, lately pupils of Professor J. B. Steere, of the University of Michigan, having secured the financial assistance of Mr. L. F. Menage, of Minneapolis, and the endorsement of the Minnesota Academy of Sciences, purpose spending two years or more in the Philippine Islands, where they will devote their time principally to the collection of corals and birds. It is their intention, however, to make frequent detours into the departments of zoology, and they have also determined to collect what fungi they can, paying particular attention to the Sphærioideæ and Gastromycetes. Through the large liberality of Mr. L. F. Menage, the expedition has been fitted out regardless of expense, and will go prepared to prosecute investigations under the most favorable conditions. The great mass of material secured will be studied at the Academy of Sciences in Minneapolis, to which city Messrs. Worcester and Bournes propose to return in 1892 or 1893.

Very important results may be looked for from this expedition. It is not designed merely as a collecting trip; for careful study of the problems of distribution is projected, and doubtless some difficult points will be settled. Both of the investigators are well known and representative western scientific men, and much is hoped for from their work in these little-known islands.

Mr. H. C. Bumpus, formerly Professor of Natural History at Olivet College, Michigan, has been elected associate Professor of Zoology at Brown University, Providence, R. I.

Mr. Ralph S. Tarr has severed his connection with the Geological Survey of Texas.

Dr. Henry Orr, Professor of Natural History in the University of Kentucky, has been appointed Professor of Biology in Tulane University, New Orleans, La.

Dr. Langdon Frothingham, of Harvard Veterinary School, has been appointed Instructor in Biology and Agriculture in the University of Nebraska, at Lincoln.

Dr. T. H. Morgan has been appointed Bruce Fellow at the Johns Hopkins University.

Drs. E. B. Jordan, S. Watase, and C. H. Eigenmann will hold fellowships in Morphology at Clarke University during the coming year.

Mr. H. S. Brode has been appointed Instructor in Zoology in the University of Illinois, at Champaign, Ill.